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George Henry Knight



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~~GEORGE HENRY KNIGHT~~

GEORGE HENRY KNIGHT

BY MRS. ISABELL BARROWS.

Some fifty-eight years ago there was born in Lakeville, Connecticut, a little son to Dr. and Mrs. Henry Martyn Knight. He received family names of George Henry and grew up in his native place as most country boys do, learning a good deal about farming, a great deal about horses, more than ordinary boys do, and above all, he learned to know and have a kindly feeling for the feeble-minded and imbecile children in his father's excellent school.

The outline of the boy's life from the time he gave up childhood's fun and frolic, till he laid it down beloved and honored, is brief. Educated at a preparatory school in Massachusetts and New Haven, at Yale for two years, and in the medical schools of New York, he was, at twenty-four, so well trained, so executive, that he was appointed superintendent of the newly organized State School for the Feeble-Minded in Minnesota, the youngest State Superintendent ever so appointed.

Then six years in Faribault, where he saw the institution under him grow as few new institutions grow, not like Joude's gourd in a night, but as the result of the ceaseless effort which he and his young wife put into making it a success. Six years there, then his recall to Connecticut to take his father's place. It was pure filial love which caused this return, but when it came to be a choice between going on to a more brilliant out-flowering

in a great state school and the plainer task of taking up the work left by his father, there was no hesitation. Love of home and of his devoted parents carried the day. And so for twenty-five years he labored in that father's footsteps till 1912 when he too ceased from his labors.

Such is the skeleton that the statistician may care to lay away in his archives, but what of the flesh and the blood, the clever mind and the dominating spirit? Let us see how these developed in these years. As a boy, Dr. Knight must have been full of eager life, making light of toil, and turning all his experiences into coin for future use. I doubt if he had the scholar's mind, but he had acute powers of observation and rare capacity in turning all that he saw into practical use, which served his purpose in life far better than a complete knowledge of the classics. In one thing in his youth he excelled, perhaps then more in promise than in fulfillment, music. Had he applied himself to that alone, he would have been a master musician. At Yale he became well known for his talent in this direction and for many years, in his home church he was the organist, and it was heart breaking at his funeral to see the mute organ and to think that the hands folded so quietly on the breast of the sleeper would never again wake the quiet of the church with the beautiful tones he knew so well how to evoke.

As he did not finish his course at Yale that University in 1878 recognized his ability and gave him the degree of Master of Arts. From New York he brought away a medical degree and a bride. Had he begun life then and there as a physician, he would have become eminent among doctors, for he had every instinct in that direction. He seemed to have the power to read his patient through and through like a human X-ray. He was always ready for emergencies. One of them once occurred on a far western train when a man, crushed and bleeding, was thrust upon the train to be taken for surgical treatment to the first city they should reach. But for Dr. Knight, the only physician on the train, who ministered to the man in wonderful ways the whole night long, the sufferer would surely have died. He was

always the one called upon, and responded invariably with alacrity and wisdom.

In his own department, caring for the feeble-minded, the imbecile, the idiotic, he was past master. No lord or lady of high degree could have been treated by him with greater respect and kindness than he showed to these poor creatures. It was a lesson to even the humanitarian to go through his institution with him and see how his own self-respect and conscious manhood were reflected, so far as it could be, in these objects of his care. He was sincerely devoted to them and I recall one night when he paced the floor in restless anxiety for fear one of the "old-timers," "Ike," I think they called him, who was critically ill, should die.

Dr. Knight's ideas as to the care of these imperfect creatures were like himself, simple and unpretending. He looked after their physical well-being with constant care, he furnished schooling for those who needed it, but not a dollar was spent for show or display. The children loved him and crowded about him as a loving father.

Of course, in his native town Dr. Knight was called upon for every kind of civic service, which he cheerfully performed. Then the state demanded him and in the legislative halls for several years he was one of the members to whom men naturally turned for his sturdy common sense and honest dealing.

At last, a still wider vista opened and he was nominated for Congress. But Death drew the curtain. The man's work was done, and well done.

The Lakeville lad, who had driven up and down the beautiful hills and hunted over the highlands as youth and man, had grown up with the strongest impress of New England upon him. From long gone ancestors he had inherited the finest qualities that go to make up a man. Purity of purpose, integrity of action, these marked him from boyhood. Kindness, unbelievable generosity, sympathy, these were also his characteristics, but far and above all these, he was an absolutely honest man. For this reason all trusted him, high and low alike, the Governor of the State and the poor widow whom someone had attempted to defraud.

Politicians of different parties trusted him because they knew he could be trusted. Little children trusted him because they not only read unbounded love in his great heart, but they felt his protecting care that nothing could change. His own little daughter grew up believing that no higher type of man could exist than was embodied in her father, and she was right. Wise men and women would echo her thought, but alas, the hundreds and hundreds who had felt the beneficence of his care could only accept it without the honoring and grateful word. To some it might seem a waste for such a life to be spent for the feeble-minded. He did not so regard it. His deep religious spirit accepted with humility the command to care for these least of the little ones and he served with gladness and a single eye to their good. So though they could not eulogize him, they wept bitter tears when they saw his face no more.

From the many tributes and resolutions passed in his honor the following extracts are made, showing the estimation in which Dr. Knight was held by the world at large, but no words can compass the honor, esteem and love in which he was held by his friends.

"Thus for twenty-seven years Doctor Knight devoted himself almost exclusively to his special work, writing and speaking on that subject for publications and meetings in many states. In his own state, he did most effective work in having Connecticut the first to place among her statutes a law making the marriage of feeble-minded or epileptic persons a crime punishable with fine and imprisonment. For the past six years during his service in the Connecticut Legislature, as Chairman of important committees,—Public Health and Safety, Humane and Appropriation Committees,—he broadened somewhat his field of usefulness in charitable work in influencing legislation for the betterment of existing conditions wherever possible. Such measures as compulsory vaccination, sanitary conditions in public places, meat inspection, the Colony for Epileptics, the Reformatory for Young Criminals, and the establishment of homes for the treatment and care of tuberculosis in the state received the most enthusiastic and untiring support of both himself and the Committees of

which he was Chairman. He continued as a member of the State Board of Pardons and as Chairman of the Tuberculosis Commission until the last. To a close friend he said that his conception of a happy life was to have a little more to do each day than a man could possibly accomplish, and to wake up the next morning with strength enough to begin all over again."

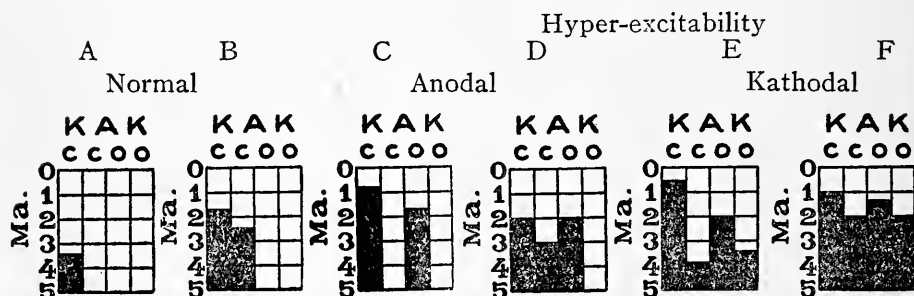
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# SPASMOPHILIA AND EPILEPSY

BY J. P. SEDGWICK, *University of Minnesota.*

Recent studies of the electrical reactions of children have made it possible to set apart a certain group of convulsions, and differentiate them from epilepsy. This group is now known among pediatricists as that of spasmophilia.

The normal galvanic electrical reactions are given by von Pirquet<sup>1</sup> as shown on the chart.



A and B represent the normal reactions in infancy. The vertical columns represent, in order, kathodal closing, anodal closing, anodal opening and kathodal opening. The number of milliamperes necessary to produce a contraction is shown on the left. The height of the blocking in, in black, shows the amount of current necessary to produce a muscular contraction with the use of the normal electrode of Stinzing\* over the peroneal nerve. Accordingly, in the normal child no contraction should be produced with less than five milliamperes with either the anodal or kathodal opening. Charts C, D, E, and F show the hyper-irritability of the spasmophilic diathesis.

The well known conditions of laryngospasm or spasmodic croup, spasmodic apnoea, tetany in children, convulsions in chil-

\*3 sq. cm. surface.

dren and certain conditions resembling petit mal are shown by the electrical reactions to be manifestations of the same spasmophilic diathesis. Ibrahim<sup>2</sup> has also shown involvement of the unstriped muscles such as the pupil and sphincters. These patients frequently show the Trousseau and facialis or Chvostek phenomena, as well as other evidences of heightened mechanical excitability.

Escherich<sup>3</sup>, judging from experimental tetany and tetany following injury to the parathyroids in human beings as well as the finding of hemorrhages in the parathyroids in certain of the cases in his clinic, considered the condition dependent on injury to these organs with consequent disturbance of their function. Many later studies with negative finding have, however, thrown doubt on this position.

Quest<sup>4</sup> found the brain of a spasmophilic child poor in calcium. Czybulski<sup>5</sup> and Schabad<sup>6</sup> both found a negative calcium balance to be associated with this condition. These findings have caused many to consider this condition to be dependent upon an anomaly in the calcium metabolism.

The affection is evidently familial. The convulsions and other manifestations are much more common in the late winter and early spring months. Children at the breast, while not wholly protected, are comparatively less affected. Convulsions in the first quarter year of life are usually due to some other condition, while the manifestations of this diathesis are more prominent from the sixth to the fifteenth month, becoming less common as childhood advances. Many of these children are rachitic and evidences of craniotabes are often present. Fevers, or digestive disturbances may change a latent spasmophilia into an active condition.

Of the clinical manifestations, the laryngospasm, spasmodic apnoea, tetany, Chvostek and Trousseau phenomena can not be confused with epileptic manifestations and serve, when they occur, as aids in the differential diagnosis. For our present purpose the attacks which resemble petit and grand mal are of the greatest interest. We are indebted to Friedmann<sup>7</sup> for the recognition of the character of these repeated non-epileptic absences

in children, which so resemble petit mal. He considers that they bear no relation to epilepsy and apparently have nothing to do with hysteria. They are characterized by the following peculiarities: They begin in apparently well children from the fourth to the seventh year, usually suddenly after some excitement, such as fear or operation. They consist of short, disturbances of consciousness without convulsions and without falling. They come on at first in a great number of attacks (6 to 10 to 100 per day and occasionally at night). The course of the disease is very tedious, usually being seven to eight years. There may be also long remissions. They have no disturbing influences upon the mental or bodily development of the child. This is a chief argument against their relation to epilepsy from which they, moreover, differ, in that the occurrence of convulsive attacks is almost never observed (fast vollige Ausbleiben). They are also to be distinguished from epilepsy by the history. Against their hysterical nature, the uniformity of the attacks, in spite of continuance for years as well as the lack of other symptoms which would make one suspicious of hysteria, may be cited. The "repeated absences" present a good prognosis in that they appear to clear up before puberty even without treatment. As far as the systematic placing is concerned, they may be related to the narcolepsy of Gelineaus and the other somewhat half understood "neurotic absences" of adults. It seems that they appear upon the foundation of a spasmophilic diathesis as, in the three cases which have been so far recently tested electrically, the increase of electrical excitability and kathodal opening contraction with less than 5 milliamperes has been observed (two of these observations were made by Mann).

Case I. which has been under my observation during the past year illustrates the above condition as described by Friedmann. S. S. was seen first August 3rd, 1912. She was seven years of age. Her father and mother are living and well. She was a full-term child and the birth was normal. She had had no acute infections and although she lived two years in the Philippines did not contract malaria. Her father was in the habit of giving her as many as six Manhattan cocktails or whiskey drinks a day,

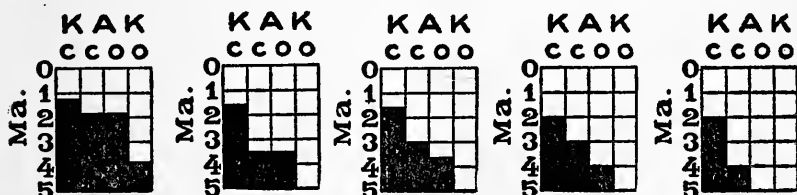


and the mother thinks that the "spells" which she has had have followed the abuse of alcohol.

Two years ago she began to have attacks which were diagnosed as "petit mal." She usually had from one to fifty of them and has had as high as one hundred a day. The attacks were first noticed at the table. She would stop eating and stare off into space. During the attacks she does not answer when spoken to. The first attacks lasted only a few seconds each but at the present time they are sometimes much longer. She was examined by two very competent men who said it was epilepsy. They gave her bromides and advised country life and all the milk and eggs she could take. She was taken to the country and given the medicine prescribed without improvement. While in the country she would sink to the ground when the attacks came on and at times had as many as one hundred "spells" a day.

The physical examination showed a fairly well-nourished, gracile child of dark complexion. She made quick movements which were not of choreiform character. The general physical examination showed nothing of importance. The electrical reactions which were markedly spasmophilic are appended.

Aug. 3rd 1912. Aug. 8th. Aug. 15th. Sept. 7th. Sept. 12th.



On August 3rd, during the examination in the office, she looked off into space and the pupils became somewhat dilated, the expression was blank and the attack lasted about ten seconds, after which she immediately became the active, alert, apparently normal child she was before. She was sitting on the edge of a table from which she did not fall and seemed to have no difficulty in keeping her position. She said nothing during the attack, although she had been talking on and off before. During the

attack she seemed to notice that her dress was unbuttoned in the back although the expression was still vacant. There was no Chvostek phenomenon. The patellar reflexes were very marked. The Achilles tendon reflexes were present and marked.

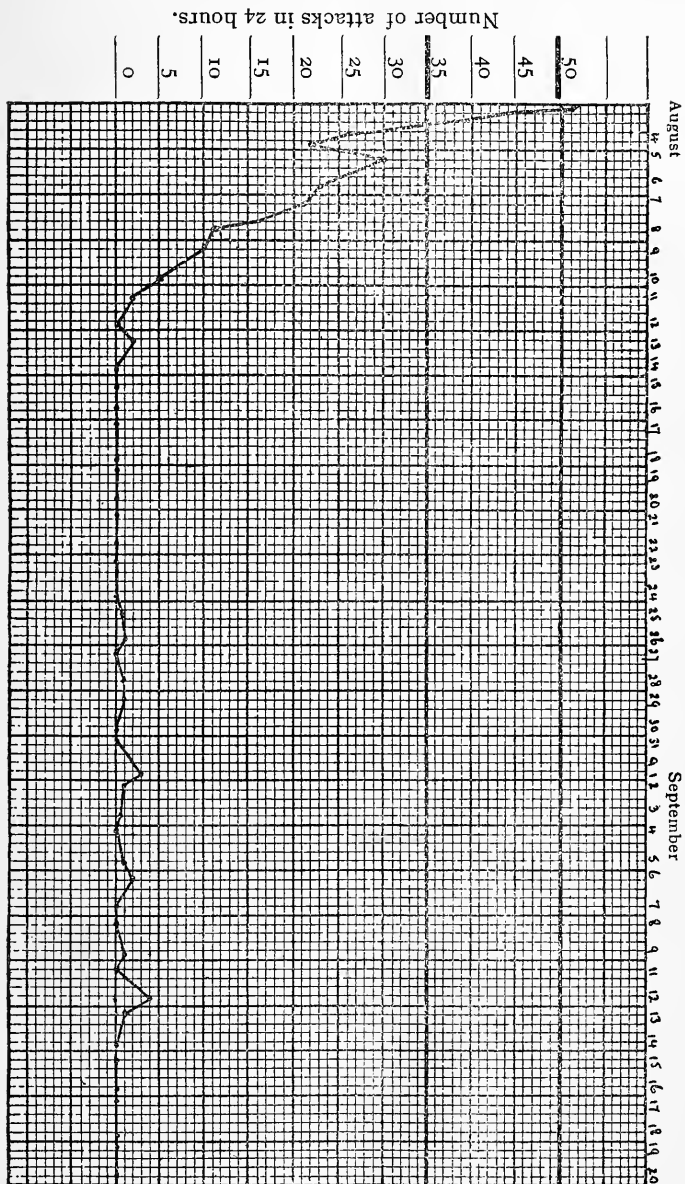
She was put on a carbohydrate diet without milk or meat and given phosphorus in cod liver oil, but no sedatives.

The decrease in the number of attacks can be readily seen from the accompanying curve extending from August 4th to September 20th, 1912.

On September 12th she left Minneapolis but continued with milk and meat-free diet and the mother reported from St. Joseph, Missouri, on October 26th, 1912, that she was having about one attack a week and that very slight. The treatment was continued. On November 26th, she reported from Cheyenne, Wyoming, that the child had had no attacks since October 26th. The treatment was ordered continued. On December 20th, 1912, she reported from Tacoma, Washington, that the child had not had any more attacks and was doing well. During the spring of 1913 she had a recurrence, but she was in the West and there was no opportunity to take her reactions. As the spasmophilic season of the year passed over she improved.

Another case, but with some motor symptoms, which is still under observation with slight improvement is that of Edith N.

Case II. Edith N., 11 years old January 10th, 1913. The mother's brother is said to have had epilepsy at the age of four or five years, but as he recovered and is now well he may have had spasmophilia. This child began to have attacks two years ago. She was sitting on a table during examination. Without any warning the eyelids dropped, the eyeballs showed nystagmus and turned upward slightly. As she leaned forward there seemed to be an attempt to right herself as one who falls asleep in a chair. The attack lasted from three to five seconds. She seemed normal immediately afterward but could give no proper description of the attack. She has from 20 to 35 of these daily. The electrical reactions may be seen on the chart.



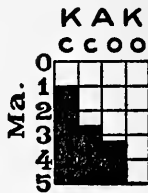
Jan. 10, '13.



Apr. 9th.



May 22nd.



If this case is epilepsy, there is spasmophilia present also as shown by the electrical reactions.

Case III. J. shows another variation. When first seen, in October, 1912, she was a girl of eight years. Two weeks before, while sitting, she said she felt sleepy. Her face was drawn down as she tried to speak. Could not articulate. The child said the tongue, left arm and leg went to sleep. She remained conscious. She did not fall asleep afterward. The child thinks that she had a similar attack one month before. She has had two attacks of about one minute's duration each since.

Examination showed a marked Chvostek phenomenon and the spasmophilic reactions as in the accompanying charts.

Oct. 28th, '12



Nov. 14th.



Nov. 27th.



Apr. 3rd.

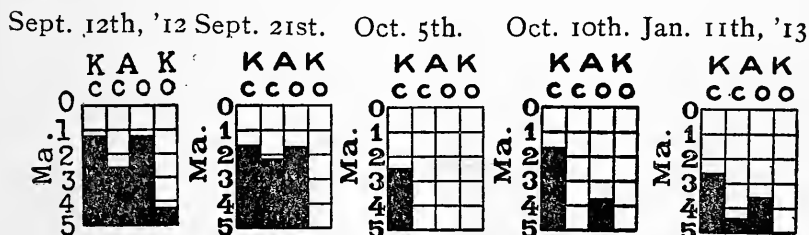


Although a competent neurologist had seen her before and made a diagnosis of epilepsy, with this occurrence she was put upon a meat and milk-free diet and given phosphorus with cod liver oil. The potassium iodide which had been already prescribed was continued. The Wassermann reaction was not present. She had no more attacks for months. During the spasmophilic season of February and March, 1913, she complained of a numbness in the tongue a few times. On March 8th, 1913 she had some difficulty in speaking for a few seconds. During the

past two months she has had no more attacks, but, as can be seen from the chart of May 24th, she is still markedly spasmophilic and also gives a very pronounced Chvostek phenomenon.

In my opinion, such electrical reactions and the Chvostek sign warrant a better prognosis than in epilepsy proper.

Case IV. J. D. This was a well-nourished boy of nine years when first seen in September, 1912. His testicles have not descended. His infant brother was seen by me in typical spasmophilic convulsions and now shows marked anodal hyper-irritability. One year before the first examination J. D. had two or three attacks a day for one week. In these attacks he fell and was rigid and unconscious. The attacks then ceased until five days before this examination. He has had from two to six daily since. His mother says that they manifest themselves at this time as a blank expression which comes over his face for a few seconds. He answers questions at this time but has no recollection of them afterward. During the physical examination he had just such a manifestation as his mother described. He appeared perfectly normal immediately afterward. His electrical reactions are shown on the chart.



The Chvostek phenomenon was very pronounced. These attacks continued, with some which showed clonic convulsions until October 10th. From that time until the present, June 4th, 1913, he has had no more seizures. The history with the electrical reactions and Chvostek phenomenon warrant the diagnosis of spasmophilia.

In the following cases the diagnostic and prognostic value of the electrical reactions becomes evident. Let us consider two non-spasmophilic cases first.

Case V. Baby M. B. was fourteen months old when first examined, December 16th, 1909. She has had repeated general convulsions while under my observation during the past three years. She has at no time presented kathodal opening or anodal closing or opening reactions with less than five milliamperes, as shown by the accompanying charts.

Feb. 17th, '10.



Feb. 21st, '12.



Case VI. Baby R. B. is syphilitic. When first examined he was fifteen months old, was having repeated general convulsions, and gave non-spasmophilic electrical reactions, that is, no anodal or kathodal opening contractions with less than 5 milliamperes of current.

April 11th, '12.



Cases VII. and VIII. are, in contrast, typical infantile spasmophilic.

Case VII. Jack I. was seven months old when I first saw him, April 21, 1911. His feeding had been the usual Horlick's and Mellin's, ending in a condensed milk climax. He has had three convulsions during the preceding week. He had craniotabes, the greater fontanelle was 4 x 6 cm. The rachitic rosary was marked and he presented a characteristic Harrison's groove. The patellar reflexes were exaggerated and he showed the Weiss reaction, which consists in a contraction of the muscles sup-

plied by the upper branches of the facial nerves upon tapping just outside of the palpebral fissure with a percussion hammer. The Chvostek phenomenon could not be elicited. A diagnosis of spasmophilia was made upon the electrical reaction.

April 21st, 1911.

|     |   |   |   |   |
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The boy was put on a carbohydrate diet consisting of oatmeal water, but as the electrical reactions improved but slowly, although he had no more convulsions, and as he was losing in weight, a wet nurse was procured on April 25th, and the administration of phosphorus and oil was begun.

He recovered completely and the later reactions were as follows:

June 3rd, 1911.

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Case VIII. McC., of Lake City, Minn., was referred to Dr. C. H. Kohler, a laryngologist, because of laryngeal symptoms. Dr. Kohler referred the child to me as he could find no intrinsic laryngeal affection. The child was eight months old, March 9th, 1911, and weighed 7,385 gms. There was a history of repeated almost daily attacks of spasmodic croup. There had been no general convulsions or other illness. The child was at the breast for the first six months, but at the time of examination it was on a cow's milk mixture. With the exception of exaggerated patel-

lar reflexes and marked Chvostek and Weiss facialis phenomena, the examination brought out nothing of importance. The electrical reactions showed marked spasmophilia. She was given

March 9th, 1911.



castor oil, followed by a day of water and two days later the mother reported that the child felt better than any other time of her life. From the date of institution of the treatment the child had no more laryngeal symptoms. Rice and other carbohydrates, as well as phosphorus and oil, were soon added and the reaction improved as shown in the chart.

March 18th.



Spasmophilia is markedly influenced by the diet. Cow's milk often increases and breast milk usually decreases the irritability. Carbohydrates have a favorable effect. The condition is worse in the late winter and spring months. Rickets is a frequent complication.

Spasmophilia rarely, if ever, manifests itself before the eighth week of life and is much less common after the fourth year. Epilepsy appears at any age. Spasmophilia often begins with numerous convulsions. Epilepsy more often begins with one attack after which they then become frequent. Appearance of the phenomena of Trousseau and Chvostek, tetany or laryngospasm, aid in the differential diagnosis.



Thiemich and Birk<sup>8</sup> followed the history of 53 eclamptic children up to from the ninth to the twelfth year. None of them became epileptic. One-third of these children remained free from intellectual disturbances. Twenty-one showed definite mental deficiency and fourteen were somewhat below normal.

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# SUGGESTIONS FOR REVISING, EXTENDING AND SUPPLEMENTING THE BINET INTELLIGENCE TESTS\*

BY LEWIS M. TERMAN, *Associate Professor of Education,*  
*Stanford University, California.*

Since the publication of the study by Terman and Childs two years ago, I have secured data from the use of the tentatively revised scale with 400 more children and I had hoped to be able to present on this occasion a somewhat detailed comparison of my own results with those reached by others, particularly with those of Goddard, Kuhlmann, and Bobertag. But the task of working over the data, involving as it does the comparison test by test not only of statistics but of important differences among the several investigators in procedure as well, has proved so burdensome as to make such a comparison impossible at the present time. This paper, accordingly, will be confined to more general considerations relating to the revision and extension of the scale. We will consider the following topics in order:

- A. Selection of children for standardizing the tests.
- B. The question of age grouping.
- C. The per cent. of correct responses necessary for placing a test.
- D. Needed shifting of tests.
- E. Criteria for the elimination and substitution of tests.
- F. Desirable number of tests per age group.
- G. Suggestions for extending and supplementing the scale.†

\*A paper presented before the Conference on the Binet-Simon scale held in connection with the Fourth International Congress of School Hygiene, Buffalo, August, 1913.

†Questions relating to uniformity of procedure in giving the tests and in securing responses, while of cardinal importance, are purposely omitted from this discussion. Some of these problems I have touched upon in a paper presented at the Conference on the Education of Backward, Truant and Delinquent Children held in connection with this congress.

### A. Selection of Children for Standardizing the Tests.

It has been suggested that for this purpose we should only make use of children whose normality is beyond dispute, carefully rejecting those who are known to be retarded or advanced. In my opinion this is not only not necessary but also incorrect in principle. We do not know, prior to the use of standardized tests, which children are normal. We can, to be sure, identify without use of the tests the children who are greatly advanced or greatly retarded; but since we can not know the exact degree of such retardation or advancement it will be unsafe to make any eliminations at all. It is evident that we can not use the age-grade distribution of children in school as a guide for the elimination of the exceptionally bright and exceptionally dull, for the reason that the average school system is productive of much more retardation than acceleration. Nor can we use the teacher's classification of children as bright, average, dull, etc., as a guide. To do so would assume the infallibility of estimates of intelligence based on common observation, an assumption which everyone will agree is unsafe. The basis for any selection of normals for use in standardizing the tests can only be arbitrary, and nothing is left but to avoid as rigidly as possible every kind of selection.

It is impossible, of course, to secure children of any age group who exactly represent the normal distribution of ability for that age. The lowest ranges of disability are not found in the school at all, and after the age of twelve or thirteen selection has occurred among school children through elimination. Schools differ also in the average intellectual level of the children who attend them, some having more, others fewer than their due share of bright or dull children. However, the error caused by restricting the tests to school pupils will ordinarily be negligible except at the lowest and highest school ages, provided care is taken to choose for the tests schools which are attended by children from middle class American homes. On the other hand, if our norms are secured from pupils classed as average by teachers a half year displacement of all the tests of the scale might easily occur, possibly more than half a year.

Interesting and valuable suggestions as to the correct pla-

cing of the tests have been made by Dr. Kuhlmann on the basis of his tests of feeble-minded persons. It is possible in this way to arrive at a comparison of the relative difficulty of the tests for feeble-minded persons of different degree of defect. Taking, for example, those feeble-minded persons (of all ages) who test at five years mental age, we can compare the relative ease or difficulty for them of the tests in age groups IV, V, VI, VII, etc. However, as has been pointed out also by Dr. Kuhlmann, such a comparison offers no guarantee that the same differences in difficulty would hold for normal five-year children. There are two reasons why this might not be the case: (1) the feeble-minded individual may not be evenly retarded along all lines; and (2) even if the retardation were regular it is possible that the feeble-minded individuals (whose real age is necessarily much greater than their mental age) might all test too high or too low, most probably too high. To use the norms secured from normal children for determining the mental age of the feeble-minded, and then to use the results from the feeble-minded as a basis for arranging the tests in order of difficulty for normals is to reason in a circle. It is like trying to lift one's self over the fence by the boot straps. It is possible that an arrangement of the tests might hold for normal children; but this is an hypothesis to be tested rather than a legitimate assumption for a revision of the scale.

### **B. The Question of Age Grouping.**

Another question in the determination of age norms relates to the proper choice of subjects according to age. Shall one take children of all ages or only those whose birthday falls within a month or two of the date when the test is made? And if we take all ages, shall we group them around the full year or around the half year? Ideally, perhaps, it would be preferable to use children of approximately even age only, as Bobertag and Kuhlmann have urged. Practically, however, there are two serious difficulties in this procedure. In the first place, many of the children under eight or nine years of age do not know the month of their birth; and secondly, it would not be easy by this plan to get access to representative six-year-old children since most children do not

enter school until a little after reaching the age of six.

Bobertag used only children within two months of even age, as did also Binet in his 1911 study. Whether this was Binet's procedure in 1908 I am unable to say as he is silent on this point. In the revision by Terman and Childs, which was completed before Binet's revision of 1911 appeared, it was assumed that Binet had grouped at eight years all who were between eight and nine, etc. If such was the case it is clear that eight-year intelligence according to Binet would really represent eight-and-a-half year intelligence. On this assumption our proposal to add a half year to a child's test age in order to arrive at his probable mental age would be valid. It is doubtful, however, whether this assumption regarding Binet's procedure for 1908 is correct, considering that it does not hold for the 1911 study. It appears to me that if we do not confine our tests to children of even age, but use the entire range of ages instead, it will be preferable to group together the children whose ages fall between six and seven, seven and eight, eight and nine. There are two weighty reasons for this. In the first place, it is not always possible with younger children to ascertain the birth month; and secondly, in common parlance the term, "ten years old," is nearly always understood to include all children who have reached the tenth birthday but not yet the eleventh. It is the average intelligence of children so classified that determines for most of us the content of the expression "ten-year intelligence," etc. To break up the habit which all of us have formed of classifying children in this way is more than we can reasonably expect of the average teacher or physician, the two classes of persons who will most often be called upon to think intelligence in terms of mental age.

The Italian investigators, Treves and Saffiotti, after applying the tests to sixteen hundred children and noting the lack of equality in difficulty of the different tests of any age group, also the lack of regularity in the percentage increase of satisfactory response from age to age, propose to do away entirely with the Binet plan of representing intellectual status by an intelligence age. Instead, they distinguish three grades of intelligence for each age from six to eight years and for the ages nine to eleven

taken together. The basis for this division is the distance the child is able to go successfully up the scale of tests when they are arranged strictly in order of difficulty. There is no apparent reason why, for psychological purposes, a scheme of this kind should not work except that it would be somewhat clumsy and hard to grasp. It is hard to see, however, that anything is to be gained by such a plan, since in order to get a basis for comparison and a meaning content for such terms as, six years strong, six years medium, etc., we should inevitably be compelled to resort indirectly to the method of age comparison. Involving as it does a set of arbitrary symbols, the handling of which with facility would require much practice, the scheme would not lend itself readily to general use.

### **C. The Per Cent. of Correct Responses Necessary for Locating a Test.**

This is a mooted question. Binet's standard, also that of Terman and Childs, was a shifting one, varying from sixty to ninety per cent. according to the character of the upward curve for the test in question. Goddard, Kuhlmann, and Bobertag, on the other hand, adhere strictly to the seventy-five per cent. standard. Bobertag considers at length the theoretical justification for this rule and comes to the conclusion that no definite proof of its correctness is available. The fact, however, that this standard gives us a distribution of mental ages for children of each age group closely approximating the so-called normal curve of distribution is, in the opinion of Bobertag, a weighty argument in its favor. It is true that for the intermediate ages from about seven to eleven this standard does cause approximately fifty per cent. to test at age, and not far from twenty-five per cent. to fall on either side. This is not the case, however, in the upper years, where, as we ascend, fewer and fewer test at age. Bobertag notes this fact but does not seem to attach special significance to it as far as the present question is concerned. Similarly, I have found in working over my own data that in the lower range of years far more than fifty per cent. test at age.

Indeed there is no evident reason why we should expect fifty per cent. of the children of any physical age to test at age (that

is, within six months, either way, of exact age); twenty-five per cent. to test plus one year or more, and twenty-five per cent. minus one year or more. If we go far enough up in the scale we soon come to a point where a range of two or three years of mental age will be necessary to include fifty per cent. of the children of a given chronological age group; and conversely, if we move in the other direction we reach a point where a range of much less than a year in mental age will include fifty per cent. of a given chronological age group. In other words, the relation between the seventy-five per cent. standard and the fifty per cent. testing normal, is purely an accidental one due to the chance of the ratio holding for a certain period between chronological age and the rate of mental development. Mental development, as Bobertag himself points out and as all workers in child psychology have long recognized, does not proceed in such a way that a year's added age always brings the same relative amount of advancement. The step from one to two-year mentality is a far greater transition than from eleven to twelve. Decidedly fewer children of twenty-four months will test minus one year than will be the case at twelve or fifteen years. The curve of distribution, plotted on the basis of mental age expressed in years, becomes more and more flattened as we go up the age groups. Mental growth, like growth in weight, must be thought of in terms of percentage increment rather than absolute increment. Since the range that will include fifty per cent. as testing at the expected mental age is a regularly decreasing one as we ascend into the upper age groups, it follows that by the Binet method our standard as to what constitutes under-age or over-age intelligence shifts in the same way, being a coarse standard in the lower years and a finer one in the upper. For illustration, a three-year-old child in order to test just below age (minus one year) must be two or three times as defective as a twelve-year-old who tests minus one year, since the former will be excelled by eighty or ninety per cent. of the children of his year group and the latter by not more than about sixty per cent. of the children in his year group. Similarly, to test just above age (plus one year) the three-year-old child must be ever so much

more intelligent (relatively to age) than the twelve year old who tests plus one year. Accordingly, our search should not be for a standard which will cause fifty per cent. to test at age, but rather for one which will reveal the true median intelligence quotient for non-selected children of each age. What we really want to know about a given child is how he tests with reference to the median child of his years rather than whether or not his intelligence is exceeded by that of ninety per cent., seventy-one per cent., or sixty per cent. of the children of his age group.

Recalling now that as we ascend into the upper age groups where the scale is essentially a finer one than at the lower end (that is, capable of distinguishing more minute differences in intelligence), a lower and lower percentage standard of correct responses is necessary for placing the test in the year where it belongs (the limit approached apparently being fifty per cent.), it would seem that if the scale were refined all along the line so as to measure differences as small as those now measured at the upper end, the proportion of correct responses to be used as a criterion in placing the tests would have to be uniformly fifty per cent. Such, I believe, is the case. However, considering that we do not yet have sufficient and suitable tests for dividing up the lower years into small fractions, our aim for the present should be merely to find such a standard as will cause the number testing at minus one year to equal the number testing at plus one year, the number at minus two years to equal the number at plus two years, etc. The search for a single per cent. standard which will cause fifty per cent. to test at age is beside the point.

#### D. Needed Shifting of Tests.

In passing it may be well to point out that the failure to take into account the fact that a higher per cent. of correct responses is necessary for placing a test in the correct age group in the lower end of the scale than in the upper gives an exaggerated impression of the too great ease of the lower, and of the too great difficulty of the upper portions of the scale. That the Binet scale of 1908 is subject to more or less error from the incorrect placing of tests is, however, generally admitted. Data which I have secured during the last two years indicate that the shifting



of tests in the Terman and Childs revision of 1911 was probably somewhat too great, particularly if allowance be made for our procedure in grouping the children according to age. I believe it will be shown, however, that the revisions made by Binet (1911), Kuhlmann, and Goddard will have to undergo further correction in the directions suggested by Terman and Childs. Among the tests which, according to my data, need shifting as much as one year from the age group assigned to them by Dr. Kuhlmann are "aesthetic comparison," "definition according to use," "three commissions," "distinguishing forenoon and afternoon," "drawing a diamond," "comparison from memory," "naming sixty words in three minutes," and possibly a few others.

#### **E. Criteria for the Elimination and Substitution of Tests.**

Several eliminations will probably need to be made, provided satisfactory substitutions can be found. Thus far, however, no study has been made of sufficient scope to bring out clearly the desirable and undesirable qualities of each test. Kuhlmann and Abelson have rendered a distinct service in showing how unsafe it is to rely on apriori considerations in pronouncing a test good or bad. In the elimination of unsatisfactory tests and the substitution of new ones it is necessary to bear in mind the essential requirements of intelligence tests in general. Of these we may mention at least five:—

1. A reliable test must bring much the same factors into play with all the subjects on whom it is used. A test, for example, which gives rise to embarrassment in timid subjects and thus balks the intellectual processes or renders them artificial, is undesirable. Such tests as those of naming words, finding rhymes, etc., ought to be subjected to critical experiment on this point. A test may in subject A be a test chiefly of attention or application; in subject B, test of rote memory, and in subject C, a test of ability to overcome embarrassment. Or, used several times successively upon the same individual a test may bring now one kind of mental operation, now another into play. To avoid the latter error, "reliability coefficients" need to be worked out for each test, after the method of Abelson; and to avoid the former

error it will be necessary to have for each test a controlled introspective analysis of the factors determining the response.

2. The tests must be such as will bring responses that can be graded with certainty giving little play to the personal equation of the grader. It is perhaps not feasible to dispense with tests which permit only the coarse grading as right or wrong, but when the test brings a fairly large proportion of responses which are hard to classify even on this rough basis its usefulness is seriously impaired. The interpretation and description of pictures, some of the comprehension questions, reading for memories, giving a sense selection, copying a square or a diamond, drawing designs from memory, and a few others, involve this source of error to a greater or less extent; although if sufficiently explicit rules are laid down for their grading, it may not be necessary to eliminate for this cause any of the tests above named. In most cases sufficiently explicit rules are not yet available and the popular use of the tests is thereby rendered difficult and dangerous.

3. On the other hand, accuracy, or exactness, is not the sole criterion of a good test. It must also be usable. Some of the tests which give the best results under ideal laboratory conditions and where rapidity is not a consideration, are impossible of use under the limitations of time and equipment which usually prevail in the case of Binet testing. As Bobertag remarks, in choosing a test it is always necessary to make a compromise between accuracy and usability.

4. The test must really be a test of intelligence, and not chiefly of school training, home influence or other accident of environment. While all these factors are bound to enter to a greater or less extent into any performance, it is possible to plan experiments which will enable us to determine their relative values. The results of intelligence tests must correlate more or less closely with other indications of intelligence such as school success, teachers' rankings and the like, also with age, though of course we can not expect perfect correlations with any of these. Past experiments indicate fairly definitely the direction in which such tests are likely to be found; namely, among the tests of com-

plex rather than elementary mental processes. The use of tests of this nature with children whose powers of introspection and report are so limited, has been objected to on the ground that we can never arrive at an intimate psychological analysis of the mental processes they involve and that we are therefore working in the dark. That the difficulties are real all will admit, but they are certainly not as great as those which confront the animal psychologist. For practical purposes, moreover, the tests may be of great value for ranking individuals according to intelligence even granting our inability to define satisfactorily in psychological terms the nature of those processes which constitute intelligence.

5. A test for a given year group should fit that age as exactly as possible. The fact that a test is too hard say for six and too easy for age eight, does not necessarily mean that it fits age seven exactly. For some to fit exactly while others do not, as is true of the Binet series, means that the tests of a given age group are of unequal difficulty and thus productive of error.

#### **F. Desirable Number of Tests per Age Group.**

All admit that error is introduced by having an unequal number of tests in the different age groups when mental age is reckoned according to the Binet 1908 plan. Later, Binet (as well as Bobertag, Kuhlmann, and others) recommends equalizing the number of tests to avoid this error. Terman and Childs propose to solve the difficulty by giving credit for a test in proportion to the number of tests in its group, thus doing away with the necessity of keeping the number in the different groups equal. Kuhlmann objects to this plan on the ground that it involves an assumption which he believes we have no right to make, namely, that "a test has the greater value for determining mental age the less the number of tests in its age group." But is not this a self-evident fact—an axiom—rather than an assumption? If there were only four tests for each age group in Binet's scale, instead of five, we should of course have to assign to each only four-fifths as great a value as they now have. What is true in this respect for the scale as a whole is true for the individual age groups. It would take a very large number of tests for ten years, say, to

test this grade of intelligence accurately, and since we must stop somewhere short of the ideal number the weight to be assigned to each test will depend upon the number used. It may be objected that if the age groups are unequal in number of tests and this method of assigning value is adopted it would be necessary in some cases for a child to pass eight or ten tests beyond the last year where he fails in none in order to earn an extra year of credit, while in other cases four or five tests would suffice. This is true but it does not in the long run introduce any error. This will be evident if it is remembered that the chances of passing four, five, six, seven, or more tests in a given age group depend upon the number of tests in that group. Granting that the tests of a group are of equal value and properly located, we are safe in assuming, if there are five tests and a subject passes three of them, that six would have been passed had there been ten in all. For illustration, if there are five tests for each age group and a child passes all the tests in the first eight years, three in the ninth, one in the tenth and one in the eleventh the total credit earned amounts to 8 plus 3-5 plus 1-5 plus 1-5 equals 9. Now if there had been five tests for each of the first eight years and ten for each of the succeeding ones the probability is that the above child would have answered all in the first eight years, six in the ninth, two in the tenth and two in the eleventh, thus earning 8 plus 6-10 plus 4-10 plus 4-10 or nine years' credit. This might fail to hold for an individual case but would necessarily hold in the long run, if we except the remote possibility of a slightly larger practice effect resulting from the use of ten tests in an age group than would be the case if there were only five. It appears to me highly desirable to adopt a plan of reckoning test age which avoids the necessity of keeping the number of tests in the different age groups equal. It not infrequently happens that a test is omitted by mistake. Still more frequently an interruption occurs, or a misunderstanding, which affects the response and makes it necessary to omit such test from our reckoning. To do this always invalidates the Binet method of granting a fifth of a year credit for each test passed. By the plan proposed by Ter-

man and Childs it is only necessary in such cases to change the unit value of the tests in the year group concerned.

In the absence of scientific evidence it is not possible to say how small a number of tests for an age group will suffice to establish intelligence age reliably. It may be that four or five or six would be little less accurate than ten or twelve. In view of our ignorance on this point it may be worth noting that in case we are to have an equal number of tests in each year either four or six tests would be more convenient than five inasmuch as our year is divided on a duo-decimal instead of on a decimal system. It is awkward for most people to interpret such expressions as 8.4 years, 8.8 years, etc.; 8 years, 4 months, or 8 years, 8 months is much simpler.

#### G. Suggestions for Extending and Supplementing the Scale.

It is unnecessary to emphasize the need of extending the scale at both extremes, at the lower end along the lines suggested by Dr. Kuhlmann and at the upper end as far as to eighteen or twenty years. Also the scale needs to be enriched throughout its length by the addition or substitution of tests which would involve types of mental functioning little tested by the present scale which probably tends somewhat to favor the type of individual designated by Thorndike as the "idea thinker," as contrasted with what he calls the "thing thinker." Tests on the order of some of those used by Healy and Fernald might profitably be standardized for this purpose. Finally, several additional scales could no doubt be devised which would greatly extend the usefulness of intelligence tests.

1. There should be one or more new scales on the order of the Binet-Simon scale and resembling the latter sufficiently to be used interchangeably with it. This would enable us to avoid a part of the practice effect which would come from using the same test several times successively with the same individual, and it would thus facilitate the investigation of the rate of a child's mental development. Coaching could be overcome in the same way.

2. It might be possible to work out a set of tests for mass

use which would give results very closely approximating those of individual testing. The difficulties of such an attempt would naturally be very great, but it would be rash to assert that they are insuperable. Data which I have secured with three or four mass tests lead me to believe that it is feasible. If so, it may be possible ultimately for one person to establish in a very short time the approximate intelligence quotient for every child in an entire city. Such tests might fall much below those of Binet in reliability and yet be of decided value for tentatively locating children who stand in need of more accurate testing.

3. For the purpose of better analyzing the character of mental growth step by step it would be desirable to have a scale made up of a small number of tests each of which could be used for children of any age say from four to five years up to fifteen or more. Some of Binet's tests approach this type. Possibilities in this line would include such tests as size of vocabulary, executing commissions, rapidity of tapping, remembering designs, numbers, or sentences; naming words, using two, three, four, five or more words in a sentence; ordering disarranged words of a sentence, finding resemblances, interpreting fables, correcting mutilated text, etc., each test to be graduated so as to offer many stages of difficulty.

4. Finally, we need very much a rough scale of pedagogical tests which could be applied at a single sitting. These would not test intelligence directly but they would often aid us in interpreting the results of intelligence tests. They would be especially desirable in the case of children of school age who are suspected of feeble-mindedness, for the ability to profit from school instruction is a significant diagnostic symptom. A serviceable test of this sort could probably be arranged on some such time schedule as the following:

|                             |            |
|-----------------------------|------------|
| Handwriting test .....      | 2 minutes  |
| Spelling test .....         | 5 minutes  |
| Language usage test .....   | 5 minutes  |
| Graded reading test.....    | 8 minutes  |
| Graded arithmetic test..... | 10 minutes |

Graded science test.....10 minutes

History test .....10 minutes

—  
Total time .....50 minutes

It goes without saying that a rough test of this sort would not take the place of the extended and accurate scales which we stand greatly in need of for pedagogical research, and that its value would be strictly confined to the purposes above indicated.

## STATE CARE FOR THE FEEBLE-MINDED\*

BY J. MOORHEAD MURDOCK, *M. D., Polk, Pennsylvania.*

In the study and care of the feeble-minded we have entered upon a new era. We talk less of pathology and therapeutics and physiological training and industrial occupations for the feeble-minded and more of eugenics, heredity, segregation and sterilization; not so much of the individual, but more of the larger problem, the group; of prevention—and, in our zeal to push forward to the goal, sometimes of extinction. How convincingly the advocates of certain schemes prophesy as to the wonderful results to be accomplished by their plan is evidenced by the remark made to me a few days ago by a well educated man who asked to what use we will put institutions for the feeble-minded when restricted marriage laws and laws for the sterilization of the unfit are generally adopted.

I would advise those who have the practical care of the feeble-minded in hand to stick closely to the bed-rock of facts we know and insist upon segregation as the one and all-important method of dealing with the feeble-minded. We know there are more feeble-minded than can be cared for in our institutions. We know that feeble-mindedness is an hereditary defect and we know that the segregation of the feeble-minded in appropriate institutions or colonies prevents the propagation of feeble-minded children, at least by those who are segregated. We believe that feeble-mindedness is the basic social problem, responsible to a large degree for poverty, alcoholism, prostitution and crime. We know that the cost of caring for the feeble-minded in hospitals and asylums, in jails and prisons and county homes is greater than would be the cost of their care in appropriate institutions. We know that the value of property destroyed by the crimes they commit would go a long way towards the construction of appropriate institutions. We must get away from the idea, and get the public away from the idea, that our institutions for the feeble-

\*Read at the meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.



minded are institutions simply for the training of feeble-minded children. The care of the feeble-minded is, as is the care of the insane, a problem for the state, not the city or county. The good to be accomplished by the segregation of an able bodied feeble-minded woman is too remote to appeal to the short sighted local guardian of the poor who is too interested in keeping down the tax rate in his district during his term of office and who is too accessible to the family and friends of the one who should be segregated.

The problem of caring for the feeble-minded today is somewhat in the same position as was the problem of caring for the insane a half century ago. The number of feeble-minded is about the same as that of the insane and though their segregation is possibly less imperative it is in the light of eugenics as important, and the cost of provision for their care and of their maintenance is very much less.

Rather than have separate institutions for children and adults, or for men and women or boys and girls, I am of the opinion that large colonies to provide for all classes should be established by the state. There are many advantages in having an institution or colony where all classes of the feeble-minded are cared for. A large proportion of the feeble-minded children under sixteen years of age are extremely helpless. The adult feeble-minded women, as a rule, under direction, make the best possible nurses for these helpless little ones whom they tenderly mother and watch over with a love and devotion greater than it is possible to obtain from paid employees. The adult feeble-minded woman can also be utilized to advantage in the laundry, sewing room, and in the domestic duties throughout the colony. The presence of children relieves the institution of monotony, which makes the institution more homelike and brings about contentment. The adult feeble-minded men are usefully employed upon the farm, in the garden, shops and occupations incidental to colony life. The school with its music and entertainments is the center of institution activity. In an institution where all classes of the feeble-minded are cared for it is frequently found advisable to transfer patients from one department to another on ac-

count of improvement or deterioration, mental or physical. Such transfer can be easily made without formality or expense when the different departments are under a single management. Furthermore, I see no objection to caring for the feeble-minded and epileptic in the same institution. The needs of the epileptic and feeble-minded are similar, and all epileptics who will be cared for in a colony are more or less mentally deficient.

The advantage of the colony over separate institutions for various classes is summed up in the report of a committee of the Thirty-fourth National Conference of Charities and Correction as follows: "The distinction of classes is imperative. The requirements, however, are best met under the same local management by suitable separation in space, variety of buildings, and equipment, and judicious grouping. Under the same management, however, the classification may be complete. The continuity of their treatment and records is preserved. The hopeful and progressive spirit of the school counteracts the tendency to condone the lowering of standards in the custodial departments."

That splendid institution, "Letchworth Village," recently established by the State of New York, may well be taken as an example of the most modern type of institution for the care of the feeble-minded and epileptic, and I would respectfully call your attention to the admirable reports of its superintendent, Dr. Little, the Trustees, and the Committee under whose direction this noteworthy institution was established. New York, after its experience with separate institutions for special classes, in this its newest institution, is providing one in which all classes of the feeble-minded and epileptic, with the possible exception of the moral imbecile or defective delinquent, will be admitted and classified within the institution.

A state colony for the feeble-minded should be planned to provide for between two and three thousand. The location should be far from any large city and rather isolated. It is not necessary to locate an institution where farm land commands a high price. A large tract of from three to four thousand acres, a part of which is woodland, should be provided. Railroad communication for passengers and freight with advantages for side track

to the institution grounds is imperative. It must be borne in mind that to admit of the proper classification such a colony will need more land than would an institution which provides for only one class of defectives.

There is a comparatively small group of the feeble-minded who have been designated by Dr. Fernald as "defective delinquents" for whom possibly a separate institution should be provided, at least in our large states, which institution should bear the same relationship to the colony for the feeble-minded as the hospitals for the insane. Defective delinquents, as a rule, do not come under observation until habituated to vicious practices, and require a closer supervision and more rigorous discipline than can well be carried out in the colony for the feeble-minded.

In our effort to relieve the state of its terrible burden of feeble-mindedness let us not become faint hearted by a contemplation of the large expenditure necessary to put in effect the only means which offers a practical solution of the question, that is the establishment by the state of institutions or colonies for the care of all the feeble-minded who cannot be properly cared for and safe-guarded in their homes. Most of the states are now doing this for their insane, and if the public, and particularly those who control the fiscal policy of the state, understood the importance of segregation of the feeble-minded there would be no question about raising the money. Think of the money the state spends for other less urgent projects! One state for example spending upwards of one hundred million dollars for canals; my own state spent fifty million dollars for roads. One-tenth of this sum would amply provide for all the feeble-minded at large in the state. Think of the cost of a single battleship to protect us against an improbable foe from without! It is not a question of the cost but of presenting the facts to the people, and especially our legislators, may appreciate the importance of segregation and that is the one and only method of coping with the problem.

Restricted marriage laws are no doubt advisable, but, as suggested by Hastings Hart, restricted marriage laws are unavailing because the unfit reproduce their kind regardless of marriage

laws. Sterilization is at best a partial remedy but is restricted in application by public sentiment. It is actually operative in only one of the eight states that have passed sterilization laws. Legislation whereby institutions for the feeble-minded may hold their inmates regardless of the wish of the parents are of no avail unless we have ample accommodations for all of the feeble-minded who cannot be cared for and safe-guarded in their homes.

My program for coping with the burden of the feeble-minded is a simple one: First, have the state provide colonies for all the feeble-minded who cannot be properly cared for in their homes, and then a law providing that any person who is feeble-minded may be committed to the colony as are the insane and not released except by permission of some properly constituted authority.

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## DISCUSSION

Dr. Chas. Bernstein, Rome, N. Y.: In our state about one million dollars was appropriated for canals and about thirty million for good roads during the last year, but we have considerable difficulty in getting money appropriated to care for the feeble-minded.

Dr. George Mogridge, Glenwood, Iowa: I do not think we will be able to do much in the way of sterilization when only one state out of eight which now have such a law enforce it and my understanding is that that state has practically abandoned it. Our own state of Iowa now has a very crude law. We are not able to operate under it, because the children are sent to us by parents or guardians, in the same way as children are sent to the public schools. We have no legal right whatever in this matter. It is entirely unconstitutional in our state to subject these children to operations except under certain conditions. I am satisfied from correspondence and knowledge gained otherwise from parents that we would depopulate our institution if we acted under this law. Therefore, I do not anticipate anything under it. We can take care of the low grade children, but the so-called morons we would never get hold of. My idea is that we get possibly five per cent.

of the morons, perhaps a few more, but ninety-five per cent. are outside of the institution. The lower types are not troublesome, but to get hold of the morons, especially the high grade, educate and care for them, and keep control of them is a problem. As long as we can keep them, they are safe. I am speaking of my own institution. Nevertheless, if we were able to segregate all we now recognize as mentally feeble, it is doubtful whether our problem would end. I am of the opinion that in a number of years, we would have almost as many as we have at the present time. The study of Eugenics shows us that there is a strain in most families which is liable to crop out at some time or other; an indication of defective germ plasm.

Dr. Bernstein: I like the plan of a large colony containing all types; not segregating the boys in one and the girls in another. Such an institution is more easily administered, the inmates are more contented, and in general it is much more satisfactory than to have separate institutions. I am not in favor of drastic measures in regard to issuing marriage licenses. I do not think it possible to restrict men to the extent such a law would require. The bill requiring physical examination before a marriage license can be issued seems to me to be simply a piece of foolishness. No physician, if he were conscientious, would certify that a man or woman were free from communicable diseases. I could not possibly do it. I can see no merit in it. I do not think it possible to carry it out. In regard to sterilization, I think we should have a law under which the physician could act. There is often a class of children in the community who need such care. We strive in different ways to reach a solution of the problem, in sterilization or segregation. We must educate all thinking men and woman so that they will recognize feeble-mindedness as a condition from which spring so many forms of degeneracy.

Dr. W. H. C. Smith, Godfrey, Ill.: I do not believe that the size of an institution should be so limited. It seems to me that two or three thousand can be cared for in one institution when the possibilities of grading and grouping are so great. Why should we not have towns of them? If the Superintendent is an

organizer, it is a benefit to the State to take care of three thousand in one institution. I would not put any limit to the number that a man can properly handle.

Prof. E. R. Johnstone, Vineland, N. J.: I am interested in the number to be cared for in one institution. I have not gotten beyond the five or six hundred mark as yet. From an economical standpoint, I believe about 750 would be the most desirable size. I have argued against a large number being placed in one institution for that reason. If the institution is not very large, we get good classes. When we put men in one institution, women in another, and children in another, are we not taking away entirely the family idea? Children add so much to the life of an institution. Is it not the family idea, the mixing idea that gives family life its charm, and would this not be practically lost in an institution of 1500 or 2000? Carrying out the same idea, I believe that epileptics ought to be in buildings by themselves. In our state we must follow out the policy that has been started. We have a Training School for Feeble-Minded children and can not care for children of other types. In Pennsylvania there are three institutions, I believe, where they are taking every class of feeble-minded. It will be necessary for them to continue that. It seems to me that we might have segregation in small colonies throughout the state. I believe in sterilization for the morons or dangerous type of feeble-minded. The morons are the most difficult to get hold of and the type that makes the most trouble. If we could get a good sterilization law that applies to them, it would be of much benefit. If we do not let them out of the institution they run away. Would it not be better to sterilize them and then let them out? I believe that the special classes in the public school will give us a better chance to select these children, who up to the ages of eight to twelve are not admitted to be deficient by their parents or teachers. While parents and teachers will not be convinced that these children are deficient, they will prove their own deficiency after they have been kept in the special classes in the public school long enough. Then they will be sent to institutions, and there, if necessary, unsexed. I believe

that sterilization would be a great benefit in caring for this special type if it could be handled by the proper authorities.

Dr. O. H. Cobb, Syracuse, N. Y.: I am heartily in favor of the idea of educating the feeble-minded of all grades. I do not think it safe or well to discharge a large proportion of these cases to make room for custodial cases. The work of Dr. Fernald's, and in fact that of several other institutions for the care of the feeble-minded, has shown that these so-called custodial cases are capable of a large amount of improvement, and that even the lowest grades can be trained to be of great use in the work of the institution. We have found that even the higher grade children who can be trained to do excellent work, are not safe when discharged because of their liability to parent-hood. Within the last few years, attention has been given to the education of the children in the so-called custodial departments, and this is as it ought to be. In the institution in Syracuse, we take only young children for our school, but we keep older men and older women. The older women work in the laundry and sewing-room and thus help to provide their support in the institution. We find this method satisfactory to a large extent. It is a matter of choice with a family as to whether it will send its children to our institution. A large proportion of the children are sent there for the purpose of training in the school. It would be difficult to get them if parents knew it were primarily a custodial institution.

I believe with Dr. Mogridge as to the farm colony. At Waverly, there is a large colony for the older boys, maintained at a much less expense than would be the case if the institution were more limited in ground. In fact, at Syracuse, because of its farm colony, and at Rome and other institutions, the boys who live on a farm colony are maintained at a much lower rate than those at institutions with more restricted ground.

What we need at Syracuse is some measure which will permit us to keep these high grade girls from the more dissolute families, from going out of the institution. If we quit working with them at fifteen or sixteen, dissolute parents come and demand them and we have no way of preventing their leaving.

Dr. Chas. S. Little, Thiels, New York: The question

whether we should have an institution of three thousand or one thousand is perhaps not so important when we consider a feeble-minded child. In planning an institution, I am opposed to a large institution,—I would much prefer six or five hundred each, to one of three thousand. When you run a colony of five hundred or about that number, you know Sam Smith and Will Brown. You meet them at their work, talk to them in regard to the work their teachers are doing with them, and you get a tremendous amount of pleasure and profit that you can not possibly get if you divide yourself up among three thousand. You have an intimate knowledge of each patient, which is practically impossible when you attempt to run a large institution, but whether it is any cheaper, I do not know.

Personally, I would separate epileptics from an institution for feeble-minded. It may not mean that they should have very different care or different training, but those who are interested in the feeble-minded do not like epileptics. If it were our problem alone to handle epileptics, we would favor separating them into different institutions; children in one, women in another and so on. The idea has a pretty strong hold in New York, one is the complement of the other. While the women are darning stockings, the men are planting potatoes. Industrial work keeps the whole institution alive. I believe the majority are in favor of separating epileptics and feeble-minded as in our state.

Dr. A. C. Rogers, Faribault, Minn.: The question of limiting the size of an institution involves particularly two considerations; first, the possibility of bringing into effective co-ordination the various influences and conditions that promote the best training and the largest degree of health, contentment and happiness. Second, economy and efficiency of administration.

It is not easy to draw any hard and fast line concerning size. The population should be large enough to afford the variety of ages and temperament that are found in ordinary life. This promotes education, for the inmates learn from one another often as rapidly or more so than from authorized teachers. It stimulates human interest among the people themselves and affords an opportunity to organize and maintain a larger variety of commu-



nity interests for training industrial occupations, social recreations and amusements than is possible in a smaller community. While it does render it practically impossible for any one person to keep in as close personal touch with each individual as is possible in a smaller institution, this is very largely offset by the opportunity of selecting a greater variety of helpers who by temperament and training can do more, each in his line, than could possibly be done by fewer people trying to do too many kinds of things for some of which they are not well fitted. The qualified specialists in a large institution, serve to stimulate every body to cultivate higher ideals and greater accomplishments and raise the general moral and spirit of the village community above the characteristic *laissez faire*, that so easily governs under ordinary conditions.

Efficiency, whether in a small or large institution, is obviously determined by the executive ability of the Superintendent. It is worthy of note that the Superintendents of the smaller institutions usually recommend that the small limit be maintained. As their institutions grow under the pressure for admission and the reluctance of states to start new plants, they gradually change the view-point. Personally, I have always advocated a limited population, but I am just as frank to admit that the Minnesota institution presents no greater problems or anxieties with a community of fifteen hundred inmates and two hundred and fifty employees, than it did with a total population of five hundred, and we have been able to do some things by virtue of the larger plant that we could not have done otherwise, under our particular governing conditions. The colony idea has added to the efficiency of the larger institution.

In the matter of sterilization, while it is to be discussed at another time on the program, I might say that I do not believe that sterilization law will be as helpful as many anticipate. I agree with those who think we should have the law so that in certain cases sterilization can be had. A great deal of well founded anxiety on the part of parents, as well as institution authorities, could be prevented if we had the legal right to sterilize in

certain cases where there can be absolutely no valid objection to it. I do not see how sterilization can be applied as a general eugenic measure at the present time. Our knowledge at best, notwithstanding many startling contributions to the subject of late, is too limited as to the definite sources of mental deficiency, and the clear differentiation of defective from normal germ plasm, to permit of any very general application of such a law.

Dr. A. W. Wilmarth, Chippewa Falls, Wisconsin: I have seen that matter killed twice in the legislature. One prominent member who voted against it at that time, has since seen the need of it and would vote for it now. I furnished the outline of the bill upon request. I believe there are certain cases that should be sterilized, especially such types as moral imbeciles and degenerates. Such a law should be passed that we might have the legal right to operate where the benefits are apparent. I agree with Dr. Smith that such a law is coming slowly but is coming surely.

Dr. Murdock: I do not wish to give the idea that I am opposed to sterilization, but I do think it is simply a drop in the bucket for supplying a remedy for the great social burden of the feeble-minded.

As to the number of inmates in an institution, it is interesting to look back over the records of some of the earliest work along this line. The size of the classes differed greatly. At one time, a group of six or eight, or even ten or twelve was considered the proper size; a class of fourteen was said to be very large. But the idea was expressed about a half century ago, that it might be possible to have these groups contain as many as fifty or one hundred. At the present time, I do not think we can place any limit as to the size of an institution. Undoubtedly the cost per capita decreases until the number has increased to seven hundred and fifty or a thousand. I believe the difference is less noticeable after that. The cost of caring for two thousand should be less per capita than the cost of caring for one thousand. Surely we have better opportunities for grouping when the larger number is under one management. I do not like the idea of classifying by grouping children of certain ages or heights, but think they should be classified on the basis of mentality, making mental clas-

sification into congenial groups. Special classes in the large schools are doing a great work in the study of these cases, especially as a clearing house, so that children who are not feeble-minded will not enter such institutions at all.

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## ASSISTANT

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## MINUTES OF THE ASSOCIATION

The 37th Annual Session of the American Association for the Study of the Feeble-Minded opened at the Michigan Home for the Feeble-Minded and Epileptic, Lapeer, June 9th, 1913. The meeting was called to order at 2:45 P. M. by the Secretary, Dr. A. C. Rogers. Dr. J. Murdoch was chosen temporary chairman, the Vice-President, Dr. J. K. Kutnewsky being absent.

The following names were presented and favorably acted upon for membership in the association, namely, for associate membership: Mr. Frank Blake, Clinton, N. Y.; Dr. B. Cogswell, Flint, Mich.; Dr. G. Kirby Collins, Sonyea, N. Y.; Miss Helen Hill, Darling, Pa.; Dr. Wm. J. Hixon, Vineland, N. J.;

Miss J. Hoffman, Rochester, N. Y.; Miss Mary E. Judson, Grand Rapids, Mich.; Dr. Henry W. Kennard, Owings Mills, Md.; Dr. John R. Haynes, Los Angeles, Calif.; Miss Louise Lombard, San Francisco, Calif.; Miss M. Elizabeth Maguire, Rochester, N. Y.; Miss Leila Martin, Rochester, N. Y.; Mrs. Edna H. Potter, Grand Rapids, Mich.; Dr. Edw. J. Reed, Jr., Camden, N. J.; Dr. F. J. Severance, Mansville, N. Y.; Miss Florence Ward, Cedar Falls, Iowa; Miss Gladys VanDeusen, Grand Rapids, Mich.; for active membership: Dr. Frank Barrows, Buffalo, N. Y.; Dr. A. P. Bussey, Ridge, Colo.; Mrs. Cordelia Caswell, Grand Rapids, Mich.; Dr. Carl J. Hedin, West Pownall, Me.; Mr. Joseph Wood Wilbur, Kalamazoo, Mich.

On motion, the following committee was appointed by the chair to draft resolutions relating to the deaths of President Carroll and Dr. Geo. H. Knight, viz: Dr. Keating, Dr. Bliss and Prof. Johnstone.

The first paper on the program, "State Provision for the Feeble-Minded," was read by Dr. Murdoch. Discussion followed by Drs. Bernstein, Mogridge, Smith, Mr. Johnstone, Drs. Cobb, Little, Rogers and Wilmarth.

A paper was then read by Dr. George S. Bliss on "The Cottage Plan in the Care of the Feeble-Minded." This paper was discussed by Drs. Murdoch, Bernstein, Rogers, Mr. Johnstone, Drs. Wilmarth, Little and Bliss.

The evening session opened at 8 o'clock with the presentation of a paper by Dr. H. G. Hardt on "Infantile Cerebral Palsy in a Report of One Hundred and Eighteen Cases," illustrated by slides. The subject was discussed by Drs. Bliss, Bernstein, and Murdock.

There being no further papers for the evening, a brief, informal discussion of field work and eugenics followed.

Dr. H. H. Goddard, Vineland, N. J., showed some lantern slides of charts relating to the work in New Jersey, with the following explanations.

We began the work in Vineland by starting with the known cases in the institution, and working back as far as we could go with the idea that the results would be rather prophetic of what

we might expect in the future under the same conditions. As you may see from the charts, the process of reproduction of defectives will be stopped in the cases of patients in institutions, but the process is going on with the rest of the families. While we can not prevent what is going on outside, we can keep records that will provide some pretty accurate and valuable knowledge for the future. I think when we have followed out the histories of cases in the different state institutions, we will have touched a sufficiently large percentage of the cases in the state to warrant some generalizations. So far, we have looked up 325 cases, but some of them are related. We are surprised however to find how little we ran into the other institutions. There is a story current that some state has reported that they traced all of their troubles back to a hundred families or so. We did not find anything like that. We found only a few insane and a very few in hospitals for insane at the present time who are connected with our charts. We have not so far, from our end of it, gathered any information that shows that the families of our patients and the families of criminals in state prisons, run back to a few families. We have found very little connection between families where there is insanity and families where there is a great amount of feeble-mindedness. However, between insanity and epilepsy, one authority has found a closer correlation. We have had rather varying results in our work along this line. We found that the feeble-minded came from cruder, more simple stock; while insanity came from an over-developed stock; stock in which the nervous system is, as you might say, on a hair trigger basis.

Dr. J. M. Barrett, Supt. Psychopathic Hospital, Ann Arbor, Mich., said: I am interested in a survey of this state at the present time. The last Legislature set aside an appropriation of \$5,000 for Eugenic work in Michigan, and it is largely for the purpose of starting this commission that I am here. I am sure I shall be very glad to get some ideas to put into practice in this work which I hope will be rather thoroughly done in Michigan. It is hardly possible for us to make a complete survey at this time. We have four institutions, all of them working along

these lines; yet we have no way of correlating the work in the State as a whole. We have no accurate data to work from. It seems possible at this time when so much interest is shown in the subject of Eugenics, to do considerable along this line, yet I doubt if it will be possible to make a survey of the State to the extent you mean.

Dr. A. C. Rogers stated that over 200 families had been examined in Minnesota; that "Family," used in this sense, means all the persons, so far as they could be determined, who are related to the persons or "sibs" from which the study originated in the institution. That the average number of feeble-minded found in these families equals nearly four and one half to a family, or nearly three and one half times as many as represent the family in the institution. That the number of insane only equals about .75 to a family and that there is little correlation between mental defect and mental alienation. That there are many pauper families that have not heretofore been recognized in the community as feeble-minded and many families that have had to be helped by the community for several generations are typical examples of this, so that the relation between feeble-mindedness and pauperism is becoming increasingly evident. That in the matter of criminality, a close correlation between it and feeble-mindedness also exists; one family chart studied, showed nearly every member to be mentally deficient and nearly all were criminals.

In the matter of arousing public interest in mental deficiency and securing Legislative support, Prof. E. R. Johnstone said: "Our committee took, first of all, the people on the waiting lists of the various institutions, and then sent letters asking if admission was still desired. Where it was, they were directed to renew their petitions and send us names and addresses of business men in their locality. We wrote personal letters to the business men, suggesting that the reason these defectives were not cared for was because we failed to get appropriations. The final result was that just prior to the convening of the Legislature, every member was flooded with letters regarding patients on our waiting lists. We wanted every member of the incoming Legislature to know the condition of affairs. The Governor said he

could not control the situation, and that it was up to the Legislature. At that time, we had been twenty-two years trying to get an appropriation. That year we succeeded in getting three-fifths of what we asked for. I think about \$350,000 was appropriated anyhow. This year, we have appropriations for two additional buildings. We appeared before the Committee with charts and the charts talked. I believe that a thing of this kind would act in other states as it did in New Jersey. The point of the whole thing is that we must go to the people and tell them what to do instead of going to the state-house and lobbying.

Dr. George S. Bliss related the story of a Massachusetts senator who was importuned by the father of a boy near the bottom of the waiting list at Waverly until the Senator said "Call off your man, Fernald, call him off. I will vote for anything you want, but call your man off."

Dr. H. H. Goddard suggested that the best effect would be realized in each state from data gathered in that state rather than by importing facts from other states. "You must trace up the families in Michigan if you want to have the legislature in Michigan believe the reports."

Dr. E. J. Emerick, Columbus, Ohio, thought it was easier to get an appropriation where there was a Central Board of Control. Ohio now has a Central Board very much interested in the segregation of defectives. The Board has planned a sort of clearing house for observing all children who are to be sent to institutions. The Legislature did not however appropriate the money asked for this year for this feature. In Ohio, it is claimed that about 50 per cent. of the children sent to the Reform School are feeble-minded. By this clearing house, it is proposed to take care of the readjustment. The plan is to have all doubtful cases taken to this special institution, where they are to be studied and the question decided as to what institution they are to go to. We have an appropriation, I think, of about \$210,000 for new buildings, and hope to be able to put up one building we can use temporarily for an observation cottage, until the next Legislature appropriates funds for a permanent building for this purpose.



Dr. Murdock: My understanding is that all children who go before the Juvenile Court are to be sent to the new institution, which will serve as a clearing house for Juvenile Courts all over the State. Is this correct?

Dr. Emerick: The children are to be given a thorough examination mentally and physically, and put in the best shape possible. If adenoids or other physical conditions require attention and an operation is necessary, it will be performed before they leave. They will be kept there for observation as long as the workers wish them. The field worker goes to the family and finds out all she can there regarding the child. If the child has committed some minor offense it will be sent indefinitely to this institution and kept there as long as considered necessary to study his case. Our Board was given the power to examine and transfer cases.

Dr. Wm. Healy, Chicago, Ills.: The possibilities under the State Laws vary tremendously. The right to have an operation performed without the consent of the parents is not general. Trouble would be made in many places, should it be done. I believe they are having some trouble in regard to this in Minneapolis now. Undoubtedly the ideal thing to do before relegating any individual to an institution is to give him a thorough examination. Col. Adams of Illinois has been trying to get this done for a long time. One great difficulty is in getting a place large enough to receive them all. In Illinois, a judge can not sentence children to institutions for feeble-minded, without the consent of the parents, but he can send them to prison. A boy of seventeen came up for trial repeatedly for stealing. Being obviously defective, he received but a short sentence only to be returned almost directly after his release for the same offense. He should of course, be permanently segregated in an institution for the feeble-minded.

#### **Thursday, June 10th.**

During the forenoon, the delegates and visitors visited the schools.

At 11:15 A. M. the Association came to order in the Assembly Hall.

A paper on "Some Special Types of Mental Defectives" was read by Dr. Healy, after which an adjournment was had for luncheon.

At 2 P. M. the afternoon session opened in the Assembly Hall.

The Chair announced the following committees:

On Organization—Dr. W. E. Fernald, Mr. E. R. Johnstone, and Dr. Geo. Mogridge.

On Time and Place—Dr. A. W. Wilmarth, Dr. H. A. Haynes,, and Dr. C. S. Little.

On Audit—Dr. G. L. Wallace, and Dr. S. J. Emerick.

Dr. Victor Vaughn, Dean of the Medical Department of the University of Michigan, addressed the Association on "Race Betterment." An audience of nearly two hundred people, including visitors from Lapeer listened attentively to Dr. Vaughn's address.

Mrs. George Buck rendered a vocal selection, assisted at the piano by Miss Florence Vincent.

Miss Adele McKinnie read a paper on "The Feeble-Minded in One Michigan County." The paper was discussed by Mr. Johnstone and Dr. Goddard.

A report on "Sterilization" by Bleecker VanWagenen was read by Mr. E. R. Johnstone.

Dr. Rogers discussed briefly the subject of "Curves of Mental Evolution in Mentally Deficient Children as Compared with Those of Normal Children."

A paper on "Feeble Inhibitionedness" by Dr. Charles B. Davenport was read by Dr. Rogers and discussed by Drs. Healy and Goddard.

Session Adjourned.

At 6 P. M. the Association was entertained by the Commercial Club of Lapeer and their ladies in the Masonic Hall. The occasion was a very enjoyable one and a tribute to the public spiritedness and generosity of the citizens of Lapeer who also provided transportation to and from the hall.

At 8 P. M. a pleasing entertainment was given by the chil-

dren of the institution in the form of an operetta "The House that Jack Built."

**Friday, June 11th.**

The session opened with a paper by Charles Scott Berry on "The 1911 revision of the Binet-Simon Test of Intelligence."

This was followed by a paper from Dr. Fred Kuhlmann on the "Degree of Mental Deficiency in Children as Expressed by the Relation of Age to Mental Age."

Dr. H. H. Goddard followed with a paper on "The Binet Test in Relation to Immigration."

Dr. W. E. Fernald read a paper on the "Diagnosis of the Higher Grades of Mental Defect."

The above papers were discussed by Drs. Healy, Barrett and Goddard.

Session Adjourned.

Session reconvened at 2:20 P. M. to hear an address by the Honorable Woodbridge N. Ferris, Governor of Michigan, which was listened to with rapt attention, and his words were received by an audience thoroughly in sympathy with the earnestness of the address.

The Association was then favored by vocal solos from Professor Wilson and Mrs. Buck, both of whom kindly responded to encores. Miss Vincent rendered a delightful piano solò.

Adjournment was then had for the purpose of visiting the sense training work of the School conducted by Miss Adele Cramer.

At 4:40 P. M. session reconvened.

Two papers, "Additional Report on Wasserman Tests," by Dr. William J. G. Dawson, and "Partial Report on Wasserman Test at Faribault, 600 Cases," by Dr. A. B. Moulton, were read by title.

Two papers, "A Preliminary Report on the Carbohydrate Tolerance of the Feeble-Minded, Especially the Mongolian Type," and "A Preliminary Report on Some Observations on the Metabolism of Calcium and Phosphoric Acid Especially in the Feeble-Minded," prepared by Dr. Amos W. Peters, were read by Mr. Johnstone.

Dr. J. F. Munson read a paper on the "Pituitary in Epilepsy."

Miss Helen T. Hill presented an interesting account of the "Work at Sleighton Farm."

A paper entitled "Contribution to the Problem of Idiopathic Epilepsy, Part First," by Dr. Edwin Katzen-Ellenbogen was read by title.

Dr. H. H. Goddard discussed "Teachability of the Feeble-Minded," as follows:

We have recently gone over all admissions of our patients to bring together their records while in the Institution and their family histories. This has raised the important question, "What are we doing along the line of training our children?" They are put into the school department when they come, if they are above the low grade imbecile or idiot. They are kept in school as long as there seems to be any use of it and are given manual work and the three R's daily. These children have been in school from two to six years. To take a concrete example, the following is a report of school progress of a child who tested six by the Binet Scale: "Is doing well in kindergarten; is learning to spell; is learning to read; is learning to write; is learning to count." Such an entry appears once or twice and then one finds nothing more about these subjects. The next report reads: "Is taking interest in basket work; in woodwork; is learning to write." This goes on for a year or so; then the next entry reads: "Is doing well in housework," or "is on the farm." Each child of a mentality of five or six has much the same story. If it is a child who tests seven or eight, the three R's prevail somewhat longer. Perhaps he can spell six words instead of three; can count to one hundred instead of twenty; can write a few words more than he did, or the record in manual work says: "Can make quite a basket; can make a wheel-barrow." A later entry says: "Is doing good housework;" or, "is doing well on the farm."

The children who test nine, ten or eleven are the only ones who get to the point where school work seems to have any valuable effect upon them. The exceptional ones learn to read pretty well and to write a fair letter. The letters are childish, but still

the parents are very glad to get them. After they have been out of school a year or two, their letters have a very different appearance than when written under the supervision of the teacher.

In industrial work these high grade children are doing work for which they have been directly prepared by their annual training. Often a boy is doing good work with the carpenter or a girl is doing good work in the sewing department of the Institution.

The question I would like to raise is—if a child has a mentality of six or seven or eight and we know his mental development has stopped, is there any use whatever of sending him into the school department, unless he is too small to go to work and we only wish to entertain him? We know the easiest way to make him happy is to send him to school. A child who tests seven or eight may get a little from manual work. A child who tests nine, ten or eleven will get something from the manual training but practically nothing from any training in the three R's.

Dr. Rogers, Faribault, Minn.: Dr. Goddard's remarks raise in my mind this important question, referred to in previous sessions, viz; What do we mean by mental development as he has just used the term? My own conception of mental deficiency, using the term as synonymous with feeble-mindedness, is that it is a condition dependent upon retarded or arrested physiological development (or evolution), that is not necessarily affected essentially by training. Whether or not this arrest operates suddenly and completely at one definite date in infancy or childhood, or represents a slowing down of the evolutionary process during these periods, it leaves the mental status of the individual at a lower level than that of a normal person of the same chronological age. What the Binet-Simon system is assumed to do, as I understand it, is to determine the intellectual level of the child at the time of examination. If this assumption is correct, and successive examinations by this system show that the level has raised, it would, of course, demonstrate the fact that the evolutionary process had progressed. It seems to me we should

not confuse "improvement" as used in this sense with "improvement" in the sense of having **learned** things. One has reference to an increased capacity to learn and the other to the accomplished fact of having learned. Teachability depends upon the intellectual level and also upon the mental "make-up" and temperament or, in other words, the balance of mental faculties at a given mental level, including, of course, the emotional states and volitional capacity, both for initiative and inhibition. Teachability, therefore, while existing in some degree at all mental ages, varies in children of the same mental age, so far as it relates to any particular thing to be taught, of the various things that are comprehended at that age.

Now the real purpose of the training, it seems to me, is to improve the pupil in knowledge of certain things, in the ability to perform certain things and to establish a behavior in relation to certain things, all of which come within the range of his capacity. The performance may or may not have been acquired. The boy of a mental age of four that has learned to milk a cow, or the girl who has learned to sew a plain seam, may not have changed the mental age during this process, any more than the normal young lady of eighteen has changed her mental level while learning to become an expert operator in a telephone exchange or a young man who has entered with credit into the learned professions. On the other hand, none of these individuals would have been characterized by any lower level if they had **not** learned to do these various things. In theory, at least, we should not confuse the average capacity to learn (the mental age) with the performance which teaching develops though it is dependent upon the mental age. The confusion in practice comes obviously from the fact that to determine **capacity**, one must ascertain content and to think of the content matter rather than the capacity that enables it to be acquired. So in our schools, it is no reflection to find that pupils do not change in mental age, especially if over thirteen chronologically, and if found to do so when under thirteen, it is only what might be expected in high grade mental deficient because of the natural process of evolution, however much it may be slowed down.

It is true that a student of Seguin might find in this idea an apparent conflict with the theory and practice of physiological education as taught by him and in which we all believe today. The conflict, however, is more apparent than real. Seguin did not teach, nor do modern physiologists teach, that nerve cells can be developed de novo by functioning adjacent ones, but only that dormant cell activity can be enlivened and nerve routes rendered less obstructive by physiological activity. It is also true that dormant cell activity and imperfect nerve tracts may hinder the testing of intelligence, so that the child may be assigned to an intelligence too low, that training will bring up to a normal (to him) level and this fact might explain some apparent evolutions found upon re-testing, etc. Of course, in all this discussion we are leaving out of consideration any criticisms of the methods used for determining mental levels. As we are all using one system for the sake of standardization, we may assume that it does the work, so far as this discussion is concerned.

The question of whether or not our schools are doing the most practical kind of teaching or not, is another matter, and one concerning which there is much misconception. While it would be out of place to enter at length into this subject at this time, there is no doubt that we are all obliged to compromise some our convictions as to the very best training, by conceding something to the preconceived ideas of parents and friends. The influence of the public schools upon the preparation for work in which most of our teachers obtain their educational motives, forms no inconsiderable influence in modifying new methods. We are almost forced to take certain lines of least resistance, feeling all the time that we are getting too far from Seguin and his philosophy, exemplified by Montessori. I think Dr. Fernald has battled quite successfully with the adverse elements and has kept a little nearer the fundamentals, the training of low grades, than any of the rest of us. His sense training classes have been a great inspiration to our schools. I believe in the training of the feeble-minded all along the line. The fundamental happiness of the whole institution community is centered about the training department and the interests it fosters, and from the

standpoint both of the public and the children, the standard should have a very practical character that would prepare for the permanent colony and other industries of the village community, because in it will the great majority of the pupils find their permanent home.

The boys we saw in the sense-training class here are the boys who ordinarily wear out the benches and spend their time in pulling buttons off their clothes. They are the boys who, after a while, will be hoeing corn, pitching hay, or doing other simple work. With children who are a step higher in mentality, the training must be a little more complex. Do not get the idea that these children should be taught to read and write the first thing, as it is clearly beyond the capacity of a great majority of those from whom the parents expect this.

Dr. Fernald, Waverly, Mass.: I have more faith in the possibility of educating the feeble-minded now than I had when I began the work, or when I had been in the work five years. I think it has been much obscured by the fact that our institutions care for extreme types, and when we get very high grade morons, we are apt to forget that education with them means an entirely different thing than it does with lower grades. Fifteen years ago, we honestly believed that much of the educational work was unnecessary and a waste of good money. Prof. James said the education of one such boy cost two thousand dollars. After all, when he grows up, he will be a very low grade laborer except under very exceptional conditions. I think we over-emphasized the economic worth of the boy. We lost the confidence of parents; the confidence of the parents of prospective patients; and also lost the confidence of legislators who noticed the deterioration of patients. We found we had developed an unhappy adolescence with no resources. There was nothing to give in the way of a stimulus. About that time, the Association met at Glenwood, and I made a trip to several institutions, very valuable for our institution. I had thought we had no room for some special classes and that we had no money for the purpose. I decided that there were a great many things quite as important as money. I went back home and got a music teacher, and we



paid a great deal of attention to the educational value of music. I think we can easily overlook the cultural value of many subjects. I believe in our work and think that every feeble-minded child should have all the education of which he is capable. If we spend ten years in teaching a boy to read or write a few words, I do not think it is worth while, but for the children who are capable of higher training, I think it would be very unfortunate to eliminate the three R's or anything else that we are now doing. I believe we should do nothing that does not give some definite results. We should get the respect of the pupils themselves; they have to see something definite. The habit of obedience and the habit of attention can be developed with it all. Instead of the troublesome, destructive and disagreeable children, you can develop a group of harmless, useful and happy individuals. I do not believe we are doing our full duty by them unless we do that thing.

Dr. Charles Bernstein, Rome, N. Y.: The patients who give us the most trouble are the ones who have been taught to read and write. They are always looking for an opportunity to send out a letter or note secretly, and give us trouble in other ways as well. If they could not write, much of the disturbance would be eliminated.

Dr. Walter E. Fernald, Waverly, Mass.: I think these patients would be much more troublesome if they did not learn to read and write. We find that the normal boy or girl often becomes very restless at the time of adolescence. Very few of our patients are in school after they reach the age of sixteen; their interests and their activities are translated into terms of running the sewing machine or the loom, cutting garments, etc. We find such a gradual transition, they are not conscious of it, and this transition should not be overlooked. If the boy of eighteen or nineteen is left in the school rooms to work under an attractive young woman, he is not willing to give it up. He would not be a male adolescent if he wanted to give it up. I have a man, forty years old, who begs every day to go back to the school-room, he wants to be under the beguiling smile of his teacher, a very attractive young woman. But it would be just as abnormal

for the farmer's daughter to go to the district school until she was twenty-four or twenty-five, and the farmer's son would be equally useless if he went to the same school until he was twenty-one. It is not fair to feeble-minded girls to give them teeming vistas which they can never realize in their lives. I believe it is very unfair to both our girls and boys to create in them tastes that will lead to unhappiness and discontent. It is just as unwholesome to have our adolescent boys in high school taught by young women. It is very unfair to the boys. I think the sooner we get our feeble-minded boys in the hands of men with frank, masculine interests, the better it is for them. My boys have women attendants until they are fourteen; we have very few male attendants; I think nine in the institution.

Adjourned.

The Association re-convened in the Hall at 8:30 P. M. with Dr. Keating in the chair.

The committee on organization recommended the following officers who were then elected:

J. K. Kutnewsky, M.D., President, Redfield, So. Dak.

H. H. Goddard, Ph.D., Vice-President, Vineland, N. J.

A. C. Rogers, M.D., Secretary and Treasurer, Faribault, Minn.

The present editorial board was, upon the recommendation of the committee, re-elected.

The auditing committee reported the statement of the Treasurer as satisfactory.

Dr. Rogers, the Treasurer, recommended that certain outstanding debts for Journals be cancelled. On motion of Dr. Fernald, a vote to this effect prevailed.

Dr. H. G. Hardt, Lincoln, Ills.: I believe I voice the members of this association when I say that we have had a jolly good time here. The general freedom and genial hospitality has never been equalled anywhere.

Dr. Frank W. Keating, Owing Mills, Md.: I know for one that I have not only had a jolly good time but will go home with a lot to think about; not only what I have seen in the institution, but what I have learned about the good work the mem-

bers of the Association are doing. From what I have seen here we can all agree that Dr. Haynes is a man whom the Association is fortunate to have as a member

Dr. C. S. Little, Thiells, N. Y.: The population having one feeble-minded person to less than 200 is something that we all feel at home in.

Dr. A. C. Rogers, Faribault, Minn.: It seems to me that the spirit of the institution here is very fine, indeed. It is not always that we find such a congenial atmosphere. I move that a vote of thanks be tendered to Dr. and Mrs. Haynes and the Board of Control for the splendid entertainment we have received during this meeting of the Association; also to Mrs. G. R. Buck, Miss Florence Vincent and Prof. U. S. Wilson, Supt. of Lapeer High School, for their music, and to the members of the Commercial Club and his other many friends in Lapeer who have assisted Dr. Haynes in making this meeting the success it has been. Passed unanimously.

Dr. Rogers: I feel that it has been a high honor to this Association that the Governor of the State has come in and given us his excellent address; that he enters very deeply into the spirit of our work is evident, and that fact should be an added inspiration to us.

The committee on resolutions concerning the deaths of President Carroll and Dr. Knight presented this report:

Since the last meeting of this Association death has claimed two of its esteemed and honored members. Mr. Albert E. Carroll, President of the Association, whose genial manner, combined with strict fidelity endeared him to all, and Dr. George H. Knight, who from his early days gave of his best thought to all that tended to a better understanding and treatment of the feeble-minded.

We wish herein to give some expression indicating the loss we all feel for these two members who were so long and so intimately associated with us in our work. We miss their companionship, and as we gather each year our thoughts will bring again pleasant memories of the times spent with them.

Behind them they leave monuments of their service to the

states where they labored for the betterment of the condition of those to whose interests their lives were dedicated.

To the bereaved family of each we extend our heartfelt sympathy, realizing that all we have known of them is but an item in their full lives, and what we miss but an atom when compared with the fullness of love and affection taken from their wives and families.

Frank W. Keating,  
E. R. Johnstone,  
G. G. Bliss.

The committee on time and place not having determined upon a recommendation, the Association adjourned to meet at the call of the Executive committee.

## REVIEWS AND NOTICES

**Eugenics—A Symposium.** Arranged by DR. CLARA HARRISON TOWN. *The Institution Quarterly. An Official Organ of the Public Charity Service of Illinois, June, 1913.*

**The Heredity Factor in Feeble-Mindedness.** H. H. GODDARD, *Director of Research, Vineland, N. J., School for Feeble-Minded.*

**Eugenics and Insanity.** H. DOUGLASS SINGER, M. D., *M. R. C. P., Director of the Illinois State Psychopathic Institute.*

**Heredity and Epilepsy. A Plea for the segregation of the Epileptic.** D'ORSAY HECHT, M. D., *Chicago, Illinois. Associate Professor of Nervous and Mental Diseases, Northwestern University Medical School, Attending Neurologist to the Michael Reese and Wesley Hospitals.*

**Prevention of Blindness Caused by Ophthalma Neonatorum.** ALBYN L. ADAMS, M. D., *Oculist, Illinois State School for the Blind, Jacksonville, Illinois.*

**Clinical Confirmation of the Hypothesis that Disordered States in the Parents Produce Defective Offspring.** S. D. W. LUDLAM, M. D., *Associate in Neurology, University of Pennsylvania, and E. P. Corson White, M. D., Sociologist, University of Pennsylvania.*

**The Crisis in our Immigration Policy.** ROBERT DE C. WARD, *Harvard University, Cambridge, Mass., Member of the Committee on Immigration, Eugenics Section, American Breeder's Association.*

**The Psychological Clinic as a Eugenic Agency.** CLARA HARRISON TOWN, PH. D., *Psychologist, State School and Colony, Lincoln, Illinois.*

**Value of Vital Statistics to the Eugenic Movement.** DR. EDWARD A. FOLEY, *Assistant Superintendent Jacksonville State Hospital, Jacksonville, Illinois.*

**The Eugenic Movement.** CLARA HARRISON TOWN.

**Race Development by Legislation.** NATHAN WILLIAM MACCHESNEY, *Chicago, Illinois.*

**The Relation of Social Diseases to Eugenics.** DR. EDITH E. LOWRY.

This symposium on eugenics covers the first seventy-seven pages of this number of the *Institution Quarterly*, and is interesting both because it reflects the many-sidedness of the problem and much of the present trend of opinion along these different lines. Goddard thinks that the most conservative estimate would make twenty-five per cent. of criminality, alcoholism, pauperism, and prostitution due to feeble-mindedness, and that probably fifty

per cent. is nearer the truth. He advocates laws prohibiting the marriage of mental defectives, their segregation, and sterilization, and thinks that with the enforcement of these we could in a generation or two not only enormously reduce the dependent classes, but save from a fourth to a half of the expense of our criminals, and paupers. From a review of the literature Singer concludes that "abnormalities in personal make-up tend to be transmitted in like form to the offspring." He agrees with Mott that the psychoses develop at an earlier age in the descendents than in the ascendants, speaking of the successive generations as found in family studies, and that there is a condensation of abnormal features in the descendents. But present knowledge is not sufficient "to justify any interference with the enormous group of neuropathic personalities except possibly to advise against the mating of two individuals in whom these traits are strongly marked." More detailed and exact study is required. He objects to sterilization because it would affect only those who could already not be permitted liberty, and because it leads to prostitution and dissemination of venereal disease. Hecht pleads for a greater consideration of the physical and vital qualities in man as against the mental and moral in eugenic measures. The epileptic, as unalterably unsound, should be segregated. In the light of our present knowledge, sterilization is still open to criticism, is premature, and as a legislative measure should not be endorsed. "Eugenics is vastly more in need of students who diagnose the illnesses of the race than amateurs who shout the cures." Adams notes that for twenty-two states for which he quotes figures an average of twenty-two per cent. of all blindness is due to Ophthalmia Neonatorum. Next to atrophy of the optic nerve, this is the largest factor in causing blindness. Of 17,767 birth in which no treatment was given nine and two tenths per cent. developed ophthalmia. Of 24,723 birth in which the silver nitrate treatment was given only sixty-five hundredth of one per cent. developed it. He advises popular education, and preventative medical treatment in all births. Ludlam and White examined the records of six hundred defective children. They lay special stress on the non-hereditary factors as the causes of arrest, and think that all environmental factors should be most carefully eliminated before pronouncing any case as hereditary. "There is as much evidence for the retarding of the development of the ovum by untoward circumstances in the environment as there is for hereditary defect." Ward compares the great care taken by the government and by individuals in importing plants and animals with reference to quality of stock and disease with the absence of such care with reference to immigrants. In the proper regulation of immigration, he thinks we have an opportunity for race development in this country that is unique in history. There is at present but little such regulation, for immigration is controlled chiefly by steamship companies, railroads, and employers of cheap labor. The existing immigration laws, with the enforcement they receive, are not sufficient to "preserve the status quo of our

population, to say nothing of promoting eugenic improvement. Means of enforcing the laws are inadequate. Fourteen per cent. of our population is foreign-born, but thirty per cent. of the insane in our institutions is foreign-born. At present it costs eight cents per capita to examine aliens. If facilities were increased so it would cost twenty-five cents per capita, he thinks two per cent. of our aliens would be found to be mentally defective. Among other things, he advises putting examiners on board immigrant ships to examine aliens before they land, and when there is more leisure and opportunity to do so. Town thinks that the uncared-for feeble-minded contribute more to crime, vice, and degeneration than any other condition, and pleads for permanent segregation. The psychological clinic can be an especially valuable aid in eugenics by detecting mental deficiency at an early age in children. Three eugenic measures are recommended. (1) Legal, permanent commitment to special institutions of all feeble-minded persons. (2) Establishment of psychological clinics in connection with public school systems. (3) Establishment of psychological clinics in connection with state institutions. Foley urges more carefully prepared vital statistics, and more careful diagnosis on the part of physicians. MacChesney thinks it neither wise nor expedient to secure radical eugenic legislation until the subject has been much further investigated. He advises legislation along the following lines. (1) To secure adequate criminal statistics. (2) To determine the relation of insanity and feeble-mindedness to crime. (3) To establish scientific laboratories in connection with criminal and juvenile courts. (4) To commit and retain feeble-minded in institutions. (5) To make special provisions for epileptics. (6) To promote sex morality. (7) To provide for assexualization of feeble-minded and criminals in certain cases. He objects to health certificates required for marriage because of its tendency to increase illegitimacy. Lowry makes forty-two per cent. of abortions and miscarriages due to syphilis, and forty-five per cent. of sterile marriages due to gonorrhoea. She thinks that "at least seventy-five per cent. of the adult male population have contracted gonorrhoea sometime and from five to eighteen per cent. have contracted syphilis." In the reviewer's opinion this is another instance in which a vivid imagination in the enthusiasm for a cause overrules sane judgment in a field where accurate data are lacking.

Faribault, Minnesota.

F. Kuhlmann.

Fifty-Sixth Report of the Board of Education, Rochester, New York. Child Study Laboratory, Rochester Public Schools, 1913. GRACE M. BOHNE.

This report gives a brief account of the work with the special classes for retarded children in the public schools of Rochester, New York. The first of these special classes was begun in 1906. The appointment of a medical inspector and of a director to investigate and organize these classes followed in the same year. In 1909 the Board adopted the Binet-Simon tests

as the official method of selecting children for the special classes, and a Binet examiner was appointed. The age-grade distribution is first found for each school. Children who are retarded three years or more in their school work are then followed by the school records, which often reveal the cause of the pedagogical retardation. A "gradation chart" is also used, which shows the relative abilities of a child in his different school subjects. The records of the child's school abilities has verified the results of the Binet-Simon tests in nine-tenths of the cases. From two to three per cent. of the children in the special classes are brought up to their normal grade in school work. Most of these, the author believes, belong to the group in which physical defect or environment has been the chief cause of the retardation. On the whole, these children improve intellectually. In one class of fifteen, who were 9-11 years old and who had spent on the average two and two-thirds years to do one year of school work, eleven gained ten and three-fifths years in mental age in one year in the special class, one remained the same, and three lost in mental age. All were mentally retarded three years or more in the beginning. A special class is organized whenever there are fifteen children whose mental age is three or more years less than their age. With one exception these were the younger children. One class was organized for children 13-16 years old. An effort is made to place out children in proper homes and in positions suited to their capacities. It is recommended that the school employ a social worker for this purpose, and to keep these children under observation after they are thus placed out. The medical examinations are made after the child has been transferred to the special class. "We contend," the author writes, "that if the cause for retardation lies chiefly in physical defect no examination and rectification can immediately restore the child to normal mental condition, especially if the physical defect has caused gross retardation."

Faribault, Minnesota.

F. Kuhlmann.





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FOR THE  
STUDY OF THE FEEBLE-MINDED

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## GOVERNOR'S ADDRESS\*

BY HON. WOODBRIDGE N. FERRIS, *Governor of Michigan.*

Mr. Chairman, Members of the Association,—I am an interloper on this program. I am here through the courtesy of the Board of Control. I happen to be Governor of Michigan and of course it is quite necessary that everything should have my stamp of approval, even if I am a democrat. My interest in this particular institution possibly gives me a right to talk to you a little while this afternoon. I realize my inability to help the distinguished men and women in attendance at this meeting. I am interested in this institution because it is a sort of mental and social barometer of the conditions existing in my state. I do not always agree with some of my friends who in pointing out the great things of this state mention the State's Prisons, the Hospitals for the Insane, the Home for the Feeble-Minded, etc. I would like to say that my state is so economically and socially healthy that there is no need for these institutions.

Somewhere, a long time ago, I picked up a book entitled "Idiocy" by Dr. Seguin. This book I read with every care and enthusiasm. I have at my command all of the best books on pedagogy in the English language and Dr. Seguin's book ranks first. I have often said that if Dr. Seguin could take human being of low mentality and accomplish what he accomplished, what ought I to do with the so-called normal children. I find that Dr. Montessori has been greatly influenced by the work of Dr. Seguin.

\*This address was given at the meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

Consulting the Britannica Yearbook I find that Dr. Montessori originally had charge of feeble-minded children five, six or seven years of age and it was found that these children were farther along under her direction at a given age than were the normal children of the same age in the ordinary public schools. This one fact convinces me that Doctor Montessori is worthy of special consideration. In other words, like Dr. Seguin's, her work has been along right lines.

The study of children from the psychological standpoint is of great value. Up to the present hour psychology as a science is not born. We do know something about the different temperaments of these children. We can, without any deep psychological analysis, learn something of their possibilities and knowing their possibilities we can train them accordingly. In a word, it is the off-hand interpretation of a child's mentality that I am particularly interested in. After reading a remarkable book by an American philosopher and psychologist, I was curious to learn how well he succeeded in "sizing up" his students, in "sizing up" the professors he associated with. On careful investigation I found out that he was unable to interpret ordinary men and women in action. For a teacher, this is a serious limitation. I have made some serious blunders along this line myself.

A young man from a farm came into my institution fifteen or eighteen years ago. He was twenty-six years of age. He wished to pursue a business course. He was tired of the farm. At the end of six months I had occasion to meet him in the chemical laboratory. He was one of the janitors. I said, "Jesse, how are you getting along." He said, "You know." Then I said, "You are not doing anything." He said, "You know." Then I replied, "Quit, I never discovered that you could do but one thing, you can make pictures, you are a natural born cartoonist, but you haven't the general education that a cartoonist must possess." Jesse left the Ferris Institute and tried his hand as cartoonist at Grand Rapids, Detroit and Chicago. In due time he landed in New York on one of the great Metropolitan papers and he discovered his limitations, or, rather, his employer discovered them. He, then, because of his love for cartooning, set about

equipping himself for his work. In other words, he studied American Literature, American politics, American social movements, and leading Americans who were doing things. For five or six years he was one of the great cartoonists on the New York World. If Jesse had shown me his portfolio of cartoons made by him when he was twelve years of age, I would not have blundered in giving him advice when he entered the Ferris Institute. Without ever receiving a lesson from an instructor, without ever reading a book on cartooning, he had, through practice and careful observation, developed an aptitude.

I am convinced that few men, few women, even of the so-called normal class ever use more than ten per cent. of their potential mental energy and few of us use any considerable portion of our brain. We do not even farm our brain out on shares. We may use a few patches of grey matter. Growing out of many similar blunders I have come to offer as my pet question, "What would you do if you could do what you want to do?" Again and again I have asked high school graduates this question only to receive the common answer, "I do not know."

I am not recommending that vocations shall always be determined at the high school age. I am simply suggesting that teachers, physicians, preachers and friends encourage the boys and girls to at least answer the question I have propounded, tentatively, to say the least. A young man or young woman may discover while pursuing a professional course that he has aptitudes that he never dreamed of. I am aware that a large amount of human material is basswood. I am aware that fathers and mothers demand that teachers shall convert this basswood into hickory. I realize that it cannot be done. Once basswood, always basswood; once hickory, always hickory. The problem of problems in education is how to make out of the basswood the best possible basswood and out of hickory the best possible hickory. The Creator evidently liked basswood or he would not have made so much of it.

The importance of knowing one's aptitudes is sometimes illustrated late in life. William DeMorgan, the British novelist, was sixty years of age when he discovered himself. He was a

graduate of a university. He was an artist potter, but up to that age he had never written a story. His first novel, Joseph Vance, reminded many readers of Charles Dickens. He is now sixty-six or seven of age and has not only made himself famous through this first novel, but he has added three to the list.

In attempting to recognize aptitudes we discover our limitations. I have no musical ability. I cannot sing a note, but thank God, I appreciate music. I know that some one of my listeners will exclaim that if I had tried, if I had had the right kind of training, I could have become fairly proficient in music. That is not so. I made a contract with an instructor offering to pay him five hundred dollars if he would train me to play simple melodies. After a careful trial he abandoned his contract. I have sense enough to know that it would not be wise for me to waste my money along this line, but at the same time I am profoundly grateful for my ability to appreciate good music. Some years ago I went from Big Rapids to Chicago in order to hear Adeline Patti sing one song. This song was at the conclusion of her entertainment in the Chicago Auditorium. For two hours I listened to what I called the prelude to this song. It was an Italian Opera and I did not get anything out of the Opera except the privilege of applauding when others applauded. I had sense enough to do that. After she had sung "Home Sweet Home" I noticed the effect upon the vast audience. Music is the universal language. She had carried her audience back to the old homes in the mountains, the old homes on the prairies, to the days of long ago. Some listener will ask, "How did this benefit you." Well, it gave me joy causing me to make the resolution that I would give to the students in the Ferris Institute more of this universal language, more inspiration and joy for the soul. In fact, it did more than that, but I haven't time to speak further along this line.

My only excuse for thus discussing aptitudes is that I feel the importance of studying the feeble-minded along the line of aptitudes. But I am also anxious to do something for the boys and girls who do not belong to this unfortunate class.

In solving the problems suggested by the feeble-minded, I am



aware that we must do everything in our power to get at the fountain head. So long as we care less about the kind of human beings produced than we do about the kind of livestock, we shall be handicapped in our progress. When people talk about fine horses, fine cattle, fine sheep, fine fruit, they are standing on a commercial foundation. It is exceedingly difficult to convince people that heart and brains have a commercial basis. By and by we shall get more stringent marriage laws, by and by we shall modify our immigration laws and we shall make some headway in the work of rearing a larger number of healthy, promising boys and girls. I am not wildly enthusiastic over this kind of special legislation. I am in favor of drastic measures with reference to the segregation of the defectives and the sterilization of sexual perverts. I am not so enthusiastic as H. E. Walters of Brown University. He says that eight states now have the sterilization laws. If all the states had these laws four generations would eliminate nine-tenths of the crime, insanity and sickness. The population of the asylums and prisons would decrease and degeneracy would cease to trouble civilization. This claim is extravagant.

I cannot, however, pay too high a tribute to the work you are doing along the line of solving this problem. We may work early and late, we may use all the magnificent provisions we have for developing the unfit, the problem of problems is, how to produce the fit. One-third of my time as Governor of Michigan is occupied in considering the demands and wishes of the inmates of our prisons. If I had my way about it I would penalize every city in proportion to the criminals it produces. We have not learned the a-b-c of conserving child life. We are proud of our schools, our churches, our homes. Nevertheless we turn over fifty per cent. of child life to the exploitation of men and women who want to make a little money. If it is a good thing for our boys to play billiards, for our boys and girls to attend moving picture shows, it is absolutely imperative that these amusements be municipalized, that they be made part of our educational system. We are putting too heavy a burden upon our public schools, upon our churches. We are not doing

enough as ordinary citizens to make the conditions of child life wholesome and inspiring.

I am not pessimistic, I am not despondent. I know what must be done. Public sentiment must be appealed to. It is the business of this association, of the citizens of Lapeer, of the men and women of clear vision in Michigan to enlighten the people. Men and women do not wish to be ignorant. They do not wish to be bad. Human nature everywhere cries out for the best that life can furnish. My suggestion is not new, it is the old suggestion that we wake up the people, that we do everything in our power directly and indirectly to arouse patriotic men and women to the appreciation of the great problem that the feeble-minded suggest. The new day is coming.

## THE DIAGNOSIS OF THE HIGHER GRADES OF MENTAL DEFECT\*

BY WALTER E. FERNALD, M. D., *Superintendent Massachusetts  
School for the Feeble-Minded, Waverly, Massachusetts.*

Many factors have contributed to the present keen interest in everything pertaining to the feeble-minded, both in Europe and in this country. The realization of the vast extent of mental defect, the inexorable requirements of the modern graded school systems with the study of the resulting retardation, the significance of feeble-mindedness as an antecedent and cause of delinquency, crime, pauperism and other social diseases, the popular application of the Binet and other psychological tests, and the comparatively recent discovery of the markedly hereditary nature of feeble-mindedness, are some of the causes of this interest. Feeble-mindedness has become a subject of vital and pressing significance to physicians, teachers, court officials, social workers and legislators. The subject is being studied from medical, biological, pedagogical, psychological, sociological, economic and eugenic points of view. The field of mental defect has been so broadened and extended as to include large groups of persons who would not have been so included even a decade ago. Naturally this extension has been almost entirely in the higher grades of defect.

A medical diagnosis of feeble-mindedness is necessary before the case can be properly or legally considered with reference to care, treatment or prevention. The practical importance of this pertinent subject is the excuse for this paper. During the past twenty years over 3000 cases of suspected mental defect (an average of three a week) have applied to the Massachusetts School for the Feeble-Minded for diagnosis, prognosis and advice as to treatment and care. These patients were generally referred by physicians, charity and social workers, child-helping

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societies, court officers, etc. As a rule the cases seen in this outpatient work are of the high grade 'moron' type, often not obviously defective. Often a wide difference of opinion has been expressed by different physicians. Some of the cases have a criminal or court record. Cases of ordinary, evident feeble-mindedness are not usually so referred. These cases evidently differ from the general run of presumably defective persons presenting themselves to a school physician or to a general medical clinic. A diagnosis is usually sought for the purpose of deciding the patient's future. Is he normal or mentally defective? Is he able to attend the public schools or to go to work? Will he eventually be self supporting? Shall he be held responsible for his criminal or immoral conduct? Is he a suitable case for adoption? The question of the suitability for marriage is sometimes involved. The diagnosis is of enormous importance to the patient and to his family. A wrong diagnosis is embarrassing to the physician and tragical to the patient.

The diagnosis of ordinary cases of idiocy and imbecility is a simple matter. Even the high-grade cases occurring in childhood present few difficulties. The upper levels of the so-called moron grade as seen in late childhood, and adolescence, are often most perplexing and difficult. An accurate and incontestible diagnosis of one of these borderline cases can be satisfactorily made only after a thorough physical examination of the patient, knowledge of the family history, personal history especially the story of his infancy and early childhood, school history and records, social and moral reactions, sexual habits, emotional stability, associates, interests, and the fullest inquiry as to his general information and practical knowledge. Appropriate psychological investigation by formal tests is especially indicated in these doubtful cases. The recent literature of the subject abounds in most elaborate and voluminous syllabi for routine examination and record, but a simple record of significant positive and negative findings is the most practical for diagnostic use. More than one examination is often required. It may be necessary to place the patient in a selected environment where his behavior and reactions may be carefully watched by a competent observer

for a period of weeks or months before a final diagnosis and prognosis can safely be made. A carefully written history of the case, prepared in advance by the parent, social worker or physician, saves time and often presents facts which otherwise would be omitted or distorted. This statement of the case should include the reasons for thinking the patient mentally defective. The age at which symptoms were first noted is very important. A physical examination will reveal any existing deformities and abnormalities,—paralyses, scars, or other evidences of injury, especially to the head; the condition of the eyes, skin, hair, thyroid gland, sex organs; evidences of syphilis, rickets, etc. Height and weight with reference to the age is of importance. The circumference of the skull and the cephalic index should be noted. The presence or absence of certain physical degeneration stigmata is significant, such as abnormalities in the size and shape of the cranium; abnormal variations in the size, shape and relative position of the ears; facial asymmetry, disproportion and lack of expression; the form, situation and structure of the teeth, etc. One or more cranial or physical developmental defects are generally found even in the slighter degrees of defect, especially if the case is of hereditary type. Even the highest types of mental defect usually have a certain degree of defective motor ability, as shown by awkward gait, clumsy movements and bodily attitudes, and a lack of alertness and dexterity. They often lack the physical grace and charm of well-formed normal youth. The performance of a sequence of movements requiring precise muscular co-ordination adapted to the age and apparent mental ability of the patient will show his co-ordinative ability. The general personal ensemble is worth considering. The physical appearance, facial expression and attitude, and the general bearing of the patient are factors to be noted. As a rule mental defectives are not physically attractive or pleasing in appearance. A bright, alert, active, well-formed attentive youth is usually not feeble-minded. The general impression of associates and neighbors of the patient as to his mental efficiency or inefficiency is often illuminating.

It should be remembered that if there is no family history it

almost always means a bad heredity. The family history should be verified and amplified by some one outside the immediate family. The modern social worker has greatly simplified this part of the problem. There is a strong tendency on the part of relatives to suppress the suggestive existence in the family of other cases of mental defect, epilepsy, insanity, specific disease, criminality, immorality, social and economic inferiority, etc. Such vicarious manifestations of family inferiority are most significant in view of the fact that presumably eighty per cent. of defectives come from feeble-minded families. The personal history, if obtainable, should chronicle injuries or accidents at birth, the order of birth (whether first or last child in family), diseases, accidents, convulsions, the age at which the patient was able to sit up, to stand, to walk, to button clothing, the age at which he began to talk, the time when the first symptoms of mental defect were noticed, etc. Some cases with very slight mental defect are persistent bed-wetters up to adult life.

The unmorality of the feeble-minded is proverbial. There is usually feeble control of moral reaction. The ability to appreciate in theory as to what is right or wrong is not applied in practice to their own conduct and actions. Inquiry should be made as to a history of general moral insensibility, untruthfulness, theft, cruelty, destructiveness, truancy and vagrancy, etc., in varying degrees. The presence or absence of sex precocity, sex perversion and sex immorality is very significant. Allied to the unmorality of the high-grade imbecile are the various anti-social tendencies often expressed by selfishness, egotism, excessive vanity, absence of shame, general incorrigibility, lack of affection and lack of sympathy.

The pedagogical history as shown by a detailed account of school life and progress is most important evidence. The school record will tell the age at which the patient began to attend school, the number of years in each grade, the present grade, school performance, with samples of his written work, and often a full and detailed account from his teachers of his successes and failures. Lack of educational advantages, unfamiliarity with the language, absences from school due to truancy, illness, or

lack of interest on the part of the parents, have a bearing on the rating of the school performance. As a rule, the family blames the teacher or the school for the retardation. The teacher's report will usually tell a story of inattention, lack of ability to discriminate, or want of sustained interest and application. Retardation amounting to three years below the age grade, with no handicap of ill health or unfamiliarity with the language, etc. is strongly suggestive of mental defect.

The social reactions should be carefully noted. Has the patient made good socially for his station in life? As a child, did other children accept him as a playmate on terms of equality? Was he teased, or abused, or 'picked upon' by other children, especially by those younger than himself? Is he annoyed and teased by his fellow workmen? Does he associate with his social equals or with his inferiors? Does he associate with and play with younger persons? Does he make friends easily? Does he attend Church and Sunday School? Did he at the usual age receive First Communion, or Confirmation, or its equivalent? Does he observe the usual amenities and social convention of his station? Is he treated as politely as other young men by young persons of the opposite sex? Does he attend and take part in parties and other social occasions?

The practical personal examination of the patient for subjective criteria of mental capacity and ability should be conducted without the presence of parents or other friends. And here again, no formal syllabus can define the line of inquiry to be followed in a given case. The queries must be varied to fit the age, sex, educational, social and environmental advantages, personal interests and experiences, personality, degree and type of defect, etc. If the patient is cordially put at ease and encouraged, he will usually tell all about himself, his sports, work, friends, hopes and plans. The city gamin and the country boy will have entirely different interests. Girls are likely to have had meagre view-points and opportunities. "Boarded-out" and "charity" children as a rule have baren experiences to draw from. Medico-legal cases may have been carefully coached not to know or not to remember. Incidentally, the inquiry should demonstrate the pa-

tient's power of attention, judgment and common-sense, veracity, discrimination, constructive imagination, etc., as well as his stock of general knowledge and information, and actual scholastic ability. Does he know what he ought to know, and can he do what he ought to do? The following questions, always varied or modified to suit the particular case, only indicate the general line of inquiry likely to show the mental capacity and ability. The answers elicited will suggest further queries.

How old are you?

Where do you live?

Is it a city or town?

How far from Boston (or the nearest large city)?

What is the railroad fare from Boston?

What towns are near your own town?

What year were you born?

How old are your brothers and sisters?

Name some large cities in Massachusetts?

What is made in Lynn, in Lowell, in Waltham?

Name some rivers in Massachusetts?

Name some mountains. Where are they?

Who is Governor of Massachusetts?

Who is the President of the United States?

Do you read any newspapers? Which ones? Which departments?

What news in the papers recently?

What books have you read? Tell the story of one.

How high is this door?

How tall are you?

How much do you weigh?

How long is this pencil?

Who is the King of England?

Do you play base ball? What position?

Did the Red Sox win yesterday? What was the score?

Who was the pitcher?

What was your mother's maiden name?

What did you see on your journey this morning?

What job would you like?



Where have you worked?

Why did you leave your last job?

What do you like to do best?

What wages did you get?

What wages does a carpenter get? A cook? A waitress? etc.

What does a pair of shoes cost? A hat? Gloves?

Name some flowers, vegetables, animals.

What size shoe do you wear?

Describe streets, mills, buildings, etc., in your town.

How long would you boil an egg?

How long would you bake a potato?

How much does a baseball cost?

The scholastic ability should be accurately tested by ordinary examination in the studies of the usual school grades. The patient reads from a school-book and copies a story. Oral and written sums may easily be devised to measure his arithmetical ability. All grades of mental defect show poor arithmetical skill. They may add and multiply, but usually subtract with difficulty. They may do short division, but few can achieve long division, except after long training. Any practical arithmetical computation at all involved is quite beyond the brightest defective. Few can solve the problem:

"If I give you a dollar and you go to town on the electric car and pay your fare in and return, and buy stamps for three letters, how much money will you have left?"

He may know the amount of the car fare and the price of the stamps, but he cannot do the sum.

The general scheme of inquiry and examination so far described was in general use before the application of psychological tests for estimating mental efficiency and capacity. Definite psychological tests in some form are now an essential and practical part of the examination of suspected cases of mental defect, especially with the higher grades. The Binet tests, in the hands of competent examiners, usually corroborate the results of clinical examination in the recognition of all degrees of mental defect in children under ten, and of pronounced defect in older persons. These tests are not so effective in detecting

slight mental defect in world-wise adolescents and adults. In other words, the Binet tests corroborate where we do not need corroboration, and are not decisive where the differential diagnosis of the high grade defective from the normal is in question. The Binet tests are not supposed to furnish an index to the **education** of the individual, but to measure his **capacity for education**. But would not many ignorant normal persons fail to be able to tell the difference between pleasure and honor, evolution and revolution, event and advent, poverty and misery, pride and pretention, as required by the adult test? The revised Binet tests require a person to listen to the following story, and then to repeat its substance:

"One hears very different judgments on the value of life. Some say it is good, others say it is bad. It would be more correct to say that it is mediocre; because on the one hand it brings us less happiness than we want, while on the other hand the misfortunes it brings us are less than others wish for us. It is the mediocrity of life that makes it endurable; or, still more, that keeps it from being positively unjust."

The words 'mediocre' and 'mediocrity' are usually unfamiliar to any person likely to be examined for mental defect. The Binet tests are psychological experiments, and to give results of definite value should be conducted with all the precautions against error which are observed in other psychological experiments. There is still some question as to the invariable fairness of these tests, in subjects with which the patient has had no practical experience, as a measure of native mental ability. The mere appearance of the unfamiliar apparatus or test material may so confuse the patient that he will not be able to do himself justice. The results of any formal tests should accord with clinical findings and with pedagogical measurements and social and economic reactions. The determination of mental defect cannot be made by automatic application of any method and scale. In the borderline adult cases the Binet tests are of value as **additional evidence**, but they are not conclusive and should not be relied upon in the absence of clinical and other evidence. The layman, especially the social worker and the teacher, are profoundly im-

pressed with the findings of any formal tests. The facility with which the pronounced case of mental defect can be roughly indicated with these tests is largely responsible for the present great popular interest in feeble-mindedness. The Binet tests are most effective as first aids to teachers and social workers in selecting suspected cases to be referred to the physician. A bit of personal experience illustrates the difficulty of eliminating irregular test conditions, and the futility of absolutely following any system of scoring. On one of my out-patient days, I had examined eight patients, one after the other. I had no luncheon and was fatigued physically and mentally. At five o'clock a social worker insisted that I examine, as I had agreed to do, her fifteen-year-old patient. I pleaded weariness and disinclination, but finally decided to give the Binet tests. The patient had waited hours for her examination and was tired and unhappy. After much effort she utterly failed to achieve the ten or eleven year Binet tests. I declined to give an opinion, but made another appointment for the next morning, when, after the patient had been put at ease and got acquainted, she readily tested up to her full age. The result the night before was really a record of my own mental state.

Healy has formulated a tentative series of psychological tests for the estimation of native mental ability and the results of formal education in adults and adolescent delinquents not definitely feeble-minded. They are of great practical value in demonstrating various shadings of the borderline zones of mental defect, as well as certain types of delinquent personality not yet generally recognized as variations of mental deficiency or of limited responsibility. The generalizations from the application of this admirably flexible and comprehensive method of examination should furnish data of great value in diagnosis and classification.

The differentiating tests of Dr. G. G. Fernald, form another notable addition to the methods of scientific precision for the diagnosis of variations of lesser mental defect as found in adolescent delinquents and presumably differing in no way from the degrees of defect in non-criminal individuals. Healey and G. G. Fernald

both emphasize the fact that the application of psychological tests should not constitute the exclusive method of examination, but that it is one method available among others, and to be supplemented by them. Indeed, as Dr. Fernald says, in the present state of our knowledge any attempt to classify any group of subjects based solely on the findings from psychological tests would commit grave errors.

As a means of exact measurement all of the special tests for the diagnosis of doubtful cases that are not decided by usual tests are of doubtful value because no age norms are given, and no practical method of scoring worked out. We can draw no exact conclusions from the results of tests in any given case when we do not know what results we would get with these tests on normal persons. Absolute standards should be used with great caution. There are many grades of intelligence among normal people. Normality of intelligence is not a fixed strength of intellect, and feeble-mindedness is not merely a question of intelligence.

The psychologists have been so interested in the diagnostic application of the Binet and other tests that while we are now familiar with certain rather empirical negative age standards and landmarks applicable to children and to cases of pronounced defect, we still possess no really scientific understanding of the exact psychological status of the ordinary cases of feeble-mindedness. We know that these different groups are, in varying degree, low in the power of voluntary attention, in discriminatory power, in constructive imagination, etc., but we know this only empirically, not in terms to be expressed qualitatively and quantitatively. The psychology of mental defect is yet to be written. The patient work of G. E. Johnson, Kuhlmann and Norseworthy along these lines should be followed up by intensive psychological study and analysis of a large series of carefully selected cases. The work can not be done adequately in a small institution laboratory but requires the personelle and the resources of the psychological department of a great university. Such research would accumulate data for generalizations which would form a basis for the formulation of tests of enormous

value in the diagnosis of puzzling borderline cases, especially of the borderline class. It is probable that the scientific mind will not be content until these upper zones of mental defect have been explored and charted, and definite diagnostic tests evolved.

From a clinical point of view the borderline case of the 'moron' grade differs from the case of actual imbecility quantitatively rather than qualitatively. Even in cases with very slight mental defect some of the cardinal symptoms and conditions of imbecility are usually found in lesser degree. There is generally evidence of physical inferiority, certain physical stigmata of degeneracy and defective muscular co-ordination. There is usually a history of delayed dentition, late walking, delayed speech and relatively long continuance of untidy habits. The patient lacks the appearance or expression of normal mentality. There is usually a history of mental defect or disease in the family. Unmoral and anti-social tendencies are rarely absent. There is a history of school retardation and poor scholastic ability on examination, with special difficulty in arithmetical and practical computations, and lack of general knowledge and information. The patient is unable to apply himself continuously in any one direction and is willing to risk severe penalties for some very small gain. His actions and conduct indicate a lack of good common sense. These facts and observations may usually be corroborated by psychological tests, but there is no justification for the popular belief that a psychological examination alone will quickly, accurately and fully determine the degree of mental efficiency or inefficiency, educational and social needs and the prognosis of patients who have puzzled and baffled parents, teachers, family physicians and alienists. Not all or even a majority of these various physical, psychical, social, ethical and economic stigmata are likely to be found in every case of actual mental defect of the higher grade. Mental defect has not yet been proven to be an homogeneous entity. The various signs and symptoms are found in infinite variety in varying degrees and proportions in different cases. Certain persons who are not more than one year retarded as shown by the Binet tests are undoubtedly so mentally deficient as to be obviously "incapable

of managing their own affairs" as shown by their long continued social and economic failures. A given case must be finally decided after a careful weighing of all the evidence which any reputable method of examination and weighing can furnish.

The Binet tests assume the twelve year mental age as the upper limit of feeble-mindedness because observation and test showed that people of any higher intelligence are usually able to float in society. And, after all, the ability of a man to earn a living, to maintain himself independently in the station of life in which he is born is the one supreme test of mental normality. If a man can secure a paying job and keep it, and satisfy his employers, it is extremely unlikely that he is mentally defective. In cases which cannot be definitely decided, the patient should usually be given the benefit of the doubt and allowed to work out his own problem under the best conditions attainable.

In these practical generalizations from the study of a large number of cases, the writer has sought to indicate the general lines of investigation which have been found useful and necessary rather than to enumerate all the signs and symptoms of mental defect which were revealed, or to present a mass of formal statistics.

# THE 1911 REVISION OF THE BINET-SIMON TESTS OF INTELLIGENCE\*

BY CHARLES SCOTT BERRY, Ph.D., *University of Michigan.*

The revised measuring scale differs from that published in 1908 in five important respects. In the first place, nine tests of the 1908 series have been omitted. The omitted tests are: Under age six, "Repeats sentences of sixteen syllables" and "Knows his age;" under age seven, "Knows number of fingers, "Copies phrase" and "Names four pieces of money;" and under age nine, "Repeats days of week" and "Gives six memories." Binet omitted "Repeats sentences of sixteen syllables" because there is a similar test under age five. The other tests he omitted because they are influenced to a great extent by instruction given in the home and school, and for that reason are not true tests of intelligence.

The next important change is in the addition of four new tests. They are: Under age ten, "Copies design from memory;" under age twelve, "Resists suggestion;" and under adult tests, "Gives difference between president and king" and "Gives sense of selection read to him." "Gives difference between abstract terms," which was a test under age thirteen in the 1908 series, has been modified somewhat and placed under the adult tests.

Twenty-six tests have been transposed. The largest number of transpositions is in the tests of the higher ages. Binet found that the tests for the years, eleven, twelve and thirteen were for the most part too difficult. As a result he has given no tests for age eleven, and has placed all the tests except one which were under that age under age twelve. The tests for age twelve he had placed under age fifteen. And the three tests which were under age thirteen he has included in the tests for adults, meaning by an adult a person who tests over fifteen.

\*Given at the meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

The next significant change is in the number of tests. In the 1908 series the number of tests varied from three under age thirteen to eight under age seven. In the revised series there are five tests under each age except age four, which still has but four tests.

The last important change is in the method of counting. The highest age under which the subject correctly performs all the tests, instead of all but one, is now taken as the base. In the 1908 series, if the subject, for example, correctly performed all the tests under age six, all but one under age seven, three under age eight and two under age nine, age seven was taken as the base and the subject was given credit for an additional year for every five tests correctly performed above that age. In the supposed case he has correctly performed five tests under the ages above seven; hence his mental age is eight. But by the new method of counting, six, the year under which he correctly performed all the tests, is taken as a base, and, as in the other case, he is given credit for an additional year for every five tests correctly performed above the age which has been taken as the base.

In order to show the comparative merits of the two measuring scales, the writer tested forty-five children in the first four grades of one of the Ann Arbor, Michigan schools, and fifty defectives, inmates of the Michigan Home for Feeble-Minded and Epileptic at Lapeer, Michigan. The tests on the school children were made only during school hours and in a schoolroom provided for that purpose, where the experimenter was alone with the subject. The conditions under which the defectives were tested were equally favorable. The tests were made with such care that the experimenter had no reason to think that the subjects tested did not do the best of which they were capable. The results show that the same subjects tested by the two measuring scales do not test alike, but test lower by the 1911 series.

We find that the number of normals and defectives testing the same in both series, higher in the 1911 series, and lower in the 1911 than in the 1908 series, is as follows:



|                            | Normals | Defectives |
|----------------------------|---------|------------|
| Same .....                 | 3       | 2          |
| Higher .....               | 0       | 0          |
| Lower .....                | 42      | 48         |
| Lower by one year or more. | 1       | 11         |

It is significant that not one person tested higher by the 1911 series than by the 1908, and that only three normals and two feeble-minded tested the same, all the rest testing lower from one-fifth to one and one-fifth years. On the average the normal children tested two-fifths of a year lower, and the feeble-minded subjects three-fifths of a year lower by the 1911 than by the 1908 tests.

In attempting to account for the difference in results we must bear in mind that all the questions omitted in the revised series of tests are from ages six to nine, inclusive, and that no new tests are added before age ten. This means, other things being equal, that of the two scales the 1908 will test the higher in all those cases where the subjects perform any of the tests omitted in the 1911 series above the age taken as the base. And when we examine the records of the twelve subjects that differ by one year or more in mental age, we find that if the questions omitted in the revised measuring scale had not been counted in the 1908 series, four of the twelve subjects would have tested the same by both scales, four would have differed by only one-fifth of a year, one by three-fifths of a year, while the remaining three would not have been affected. The disparity of results in these latter three cases can be explained by the different method of counting used in the revised series of tests. By the 1908 scale the highest age under which all the tests, or all but one, are correctly performed is taken as the base, while in the revised scale only the highest age in which all the tests are correctly performed can be used as the base. Under the higher ages especially, where the tests are not so well graded, this method of counting may make a great difference in the results. For it not infrequently happens that the subject may perform all the tests but one under age twelve or eleven and not do so well under the next lower age. This was the case with these

three subjects. The bases by the 1908 scale were twelve, ten and twelve, and by the revised scale the base in each of the three cases was eight. If the revised method of counting had been employed in the 1908 series of tests, the results would have been no higher than those of the revised series. Evidently in such cases the revised method of counting gives the more accurate results, for surely the subject would not be rated as twelve years mentally if he cannot perform the tests under ages eleven and ten.

Many of the tests of the 1908 series have been transposed in the revision of 1911, and these changes have in some cases produced a slight difference in results.

In the 1908 scale the number of tests under each age varied from three under age thirteen to eight under age seven. This lack of uniformity made it possible in some cases for one subject who had performed fewer tests than another to rank as high mentally. For example, if one subject performed all the tests under ages six and seven, his mental age would be seven, but if another subject failed in three of the tests under age seven and one under age six, his mental age also would be seven, for six would be the base and he would be given credit for an additional year for the tests performed under age seven. This defect has been remedied in the revision of 1911 by having the same number of tests under each age except age four.

It seems to the writer that the revised scale of 1911 is an improvement on the 1908 tests of intelligence in the following respects:

1. The tests which were most influenced by home and school instruction have been omitted.
2. The change in the method of counting reduces the liability of error.
3. The same number of tests under each age makes it impossible for one subject to rank as high mentally as another if he has not performed the same number of tests.
4. By the revised scale the subjects do not measure as high mentally as they do by the 1908 scale. This is an advantage as

far as the lower ages are concerned, as it is probably true that the tests of the 1908 scale for the lower ages are too easy.

However, when we turn to the higher ages we find that the scale is far from perfect. The fact that Binet in the revised scale has placed all the tests except one which were under age eleven under age twelve, and the tests which were under age twelve he has put under age fifteen and the three tests which were under age thirteen he has made tests for adults, shows very clearly that he thought this part of the scale to be the least reliable. It is evidently very important that these tests under the higher ages be thoroughly tried out before we place much confidence in them as a means of determining the intelligence of individuals, especially when we bear in mind that it is by means of these tests that we hope to distinguish between high grade morons and normal individuals.

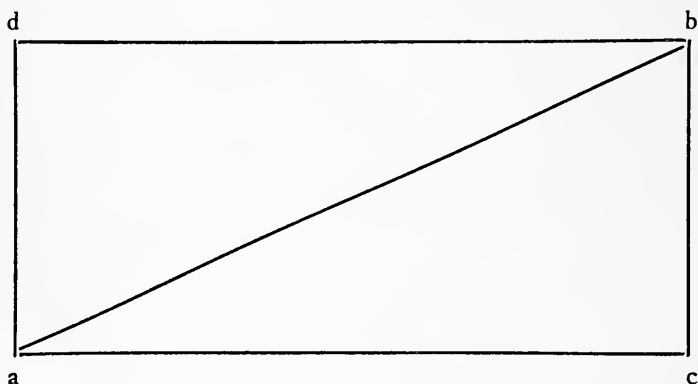
With this thought in mind the writer during last December gave Binet's adult tests to three sections of a class in educational psychology. Of the sixty-eight students in these three sections all except three or four were seniors in the literary department of the University of Michigan. Fifty-three were girls and fifteen were boys. The tests were given to each section separately during the regular recitation period, which for all three sections came in the morning. Before beginning the tests the experimenter explained to the class that the success of the experiment depended upon each subject's paying the closest of attention and doing the best of which he was capable. And if for any reason a subject was not able to do his best or was influenced by his neighbor he was to indicate the same on his paper so that his results might not be counted. Or in case any subject had previously performed any of these experiments he was to state that fact.

The tests were given in the following order:

1. "Draws design of cut paper unfolded." In the presence of the class the experimenter folded a square piece of paper twice, forming four squares, and then cut from the middle of the crease formed in the second folding a small triangle. The class was now instructed to draw a picture of the paper as it

would appear when unfolded. Only those papers were counted correct on which two diamonds were drawn, each placed in the middle of one half of the paper.

2. "Draws inverted triangle." The following figure was drawn on the blackboard in front of the class. First the class was instructed to draw triangle  $adb$ , the upper half of figure. After they had done this they were directed, in imagination to pick up triangle  $abc$ , turn it over, and place  $c$  upon  $b$  so that  $ca$  would fall along  $ba$ , then to draw the triangle as it would appear in this new position. Only those results were counted as correct in which a right angle was drawn at  $b$  and in which  $ac$  was shorter than  $ab$ .



3. Difference between president and king. There are three differences between a king and a president of a republic. What are they? Only those papers were marked as correct which contained the following ideas: (1) The king inherits his power, the president does not; (2) the king holds his office for life, the president holds office only for a limited time, and (3) the power of a king is generally greater than that of a president.

4. Difference between abstract terms. "What is the difference between laziness and idleness? What is the difference between event and advent? What is the difference between evolution and revolution?" Two correct responses required.

5. Gives sense of selection read. The experimenter in-

structed the class to listen carefully to the selection he was about to read for after he had finished reading he was going to ask them to write down the sense of the passage. He then read aloud slowly and distinctly the following selection:

1. "Many opinions have been given on the value of life. Some call it good, others call it bad. It would be more just to say that it is mediocre, for on the one hand our happiness is never so great as we would have it, and on the other hand our misfortunes are never so great as others would have them. It is this mediocrity of life which makes it just, or rather which prevents it from being radically unjust."

The answers were not counted as correct if the following thought was not reproduced. "Life is neither good nor bad, but mediocre, for it is inferior to that which we desire, and superior to that which others desire for us." In each test the subjects were given as much time to answer as they desired. The results of the tests are as follows: Sixty-five per cent. passed Test 1, "Draws design of cut paper unfolded;" fifty-eight per cent. passed Test 2, "Draws inverted triangle;" thirty-two per cent. passed Test 3, "Gives difference between president and king;" eighty-two per cent. passed Test 4, "Gives difference between abstract terms;" eighty-two per cent. passed Test 5. "Gives sense of selection read." If we consider that a test is too difficult for the age that it is supposed to test if it is not performed correctly by at least seventy-five per cent. of those of that age, then all of these tests, with but one exception are too difficult for this group of college seniors. We surely have no reason to think that the intelligence of such a group is not up to that of the average adult. It may, however, be objected that the students would have done better if they had been tested individually. But when we bear in mind that these students were accustomed to class examinations, and that in these tests they were not hurried we believe that this objection has but little weight.

Some interesting things are suggested when we compare the results of the tests from the standpoint of sex, although we cannot attach much significance to the differences because of the

small numbers tested, especially of the boys. In Test 1, "Draws design of cut paper unfolded," sixty-nine per cent. of the girls were successful while only fifty per cent. of the boys succeeded. It is not unlikely that greater experience of the girls in cutting paper and cloth would in a measure account for this difference. On the other hand, in Test 2, "Draws inverted triangle," sixty-nine per cent. of the boys were successful while only fifty-five per cent. of the girls succeeded. This difference may be accounted for possibly by the greater interest of boys in geometry and mechanical drawing. Again in Test 3, "Gives differences between president and king," the boys have decidedly the advantage, forty-seven per cent. succeeding where only twenty-seven per cent. of the girls were successful. The greater interest of the boys in political matters might account for this difference. But the most striking difference between the boys and girls, and the one hardest to account for, appears in Test 5, "Gives sense of selection read," where fifty-five per cent. of the girls were successful and none of the boys.

Only three students succeeded in passing all five tests, sixteen passed four tests, seventeen passed three tests, twenty passed only two tests, eleven one and one none. Only fifty-three per cent. passed three or more of the tests, so if we took as our standard the passing of three tests it would still be too high. Among the students who succeeded in passing all the tests we do not find the brightest students as measured by the grade of work done in this course.

Our results seem to indicate three things. 1. That the adult tests of Binet are too difficult. 2. That the tests are of such a nature that previous training rather than natural ability may be the determining factor in success or failure. 3. That there is but little correlation between ability to perform these tests and ability as revealed by class room work.

# PSYCHOLOGICAL PRINCIPLES UNDERLYING THE BINET-SIMON SCALE AND SOME PRACTICAL CONSIDERATIONS FOR ITS CORRECT USE\*

BY LEWIS M. TERMAN, *Associate Professor of Education,*  
*Stanford University.*

## A. Special Characteristics of the Binet-Simon Tests.

Psychologists had experimented with intelligence tests for at least thirty years before the Binet-Simon scale made its appearance. The question naturally suggests itself why the latter should have proved so successful and previous effort so futile. There are three respects in which the Binet-Simon tests represent a departure from most previous work in this line.

1. In the first place, Binet was the first to make use of the **scale** or **norm** idea. By this plan one devises a series of tests ranging from very easy to difficult and then ascertains empirically how far children of the different ages can go in the series. It will be understood, of course, that Binet did not set out to invent tests of six year intelligence, ten year intelligence, etc., but that the correct placing of the tests was arrived at by trying them out on children of different ages.

The plan has the great advantage of giving us standards, or norms, which are easily grasped. For example, the average performances in these tests of a large number of children all of whom are eight years of age, can be called "eight year intelligence," and similarly for the other age norms. To say, for illustration, that such and such a twelve-year-old child has the intelligence normal to eight years is a statement whose general import does not need to be explained. Previous investigators had worked with subjects the degrees of whose intelligence was unknown, and with tests the difficulty of which was equally unknown. An immense

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amount of ingenuity was spent in devising tests which were used in such a way as to preclude any very meaningful interpretation of the responses. And yet the scale idea is a device so simple and necessary that one marvels why it should have been overlooked so long. It is the story again of Columbus and the egg.

2. In the second place, the Binet tests differ from most previous attempts in that they are designed to test the higher and more complex mental functions instead of the simple and elementary processes. Hence they set problems for the reasoning powers and ingenuity, provoke judgments about abstract matters, etc., instead of attempting to measure sense-discrimination, physiological retentiveness, rapidity of reaction and the like. Experimenters had generally considered the higher mental processes too complex to be measured directly, and accordingly sought to get at them indirectly by correlating supposed intelligence with simpler processes which could be measured. While they were disputing over their various contradictory findings in this line of exploration Binet went directly to the point and succeeded where they had failed. It is now generally admitted that higher intelligence is little concerned in the elementary processes. Many of the animals have keen sensory discrimination. Imbeciles do not differ very markedly from normal children in sensitivity of the skin, visual acuity, simple reaction time, type of imagery, etc. But in power of comprehension, abstraction and ability to direct thought, in the nature of the association processes, information and spontaneity of attention, they differ enormously.

3. Finally, Binet's success came from his abandonment of the "faculty psychology" which, notwithstanding the general supposition to the contrary, had largely given direction to the current work with mental tests. Where others had attempted to measure memory, attention, sense discrimination, etc. as separate capacities or functions, Binet undertook merely to ascertain the general level of intelligence. Others had thought the task easier of accomplishment by measuring each division or aspect of intelligence separately and summing the results. Binet, after years of exploration along the old lines, broke away from them



and undertook, so to speak, to triangulate the height of his tower without first getting the dimensions of the individual stones which made it up. At first blush it would seem easier to measure a part, or one aspect, of intelligence than all of it, but Binet showed that such is not the case. The fallacy lies in the fact that the parts are not separate parts and cannot be separated by any refinement of experiment. They are interwoven and intertwined. Each ramifies everywhere. The analogy of the individual stones of the tower does not really apply. Memory, for example, cannot be tested separately from attention, or sense discrimination separately from associative processes, etc. Instead of vainly trying to disentangle them Binet decided to test their combined functional capacity, without even pretending to analyze in any final way the relative contribution of each to the total product. Intelligence tests have been successful just to the extent to which they have been guided by this aim.

#### **B. Avowed Limitations of the Binet Tests.**

In several instances the Binet tests have been severely criticized because of their unfitness for certain services which in reality they were never meant to render. This is unfair. We can not make a just evaluation of the scale without bearing in mind their avowed limitations.

In the first place, they do not pretend to test, or measure, the entire mentality of the child, but only intelligence. There is no pretense of testing the emotions or the will except in so far as these naturally display themselves in the tests of intelligence. This at once restricts the use of the scale very greatly. It is not a tool for the analysis of those emotional or volitional aberrations which lead to mental disorder or criminality, except in so far as these involve disturbances of intelligence. No one has ever supposed that hysteria, for example, presents a progressive reduction of intelligence to the infantile level. Not only do factors other than intelligence play a leading role with respect to sanity, morality, etc., but they even determine the direction in which the intelligence itself shall be applied, its method of work, and therefore its fruitfulness.

Secondly, the Binet scale does not pretend to test the full

range of an individual's intelligence, but only its general level. It can never serve as a detailed chart for vocational guidance, although it is certainly capable of bounding the vocational territory in which the individual's intelligence would probably permit success. Some people, I find, seem to look upon the tests as a kind of new and reliable phrenology.

Nor do the tests pretend to be an infallible guide for pedagogical procedure. When a pupil has been tested the teacher frequently asks, "How shall I change my methods to suit the needs of this child?" It ought hardly be necessary to emphasize that although pedagogical methods must take account of the results of intelligence tests, the latter do not suggest in detail the appropriate methods. Suitable educational treatment of various grades of intelligence will have to be patiently and laboriously worked out in practice.

### C. General Reliability of the Scale.

Tests of the scale have sufficiently demonstrated its general reliability, disregarding of course the admitted need of certain improvements. With the partial exception of Treves and Saffioti, the Italian investigators, who while in the main approving the tests are inclined to look with distrust upon the Binet method of grading intelligence by mental ages, all who have worked with the scale agree on this point. One who knows how to apply the tests correctly and who is experienced in the interpretation of responses can give a more enlightening estimate as to the general level of a child's intelligence after a single forty minute sitting than it would be possible for the intelligent teacher or physician to give on the basis of many months of close observation. Dr. Kuhlmann satisfactorily proves this, at least as regards feeble-minded children. He had 150 such children whose mental ages ranged by the Binet scale from eight to twelve years graded by their teachers. Three or more teachers graded each child and were allowed two months in which to make the estimation. Their classification was then compared with that given by the Binet scale. The results showed wide disagreement among the teachers in estimating the intelligence of the same children. For nine children the difference was three years; and for nineteen, two

years. Dr. Kuhlmann concludes that as regards this class of children "there can be no question about the fact that the Binet-Simon tests do not make half as frequent or half as great errors in mental ages as result from gradings on careful, prolonged general observation by experienced observers."

Goddard's observations on the industrial capacity of different mental ages among feeble-minded individuals are also valuable evidence as to the reliability of the tests, since his tabulations reveal a gradual increase in occupational efficiency with rise of mental age.

Bobertag and others have found the reliability of the scale for normal children confirmed in the fact that when those of any age are tested by the scale there results a distribution of mental ages very similar to the so-called normal curve of distribution. That is, the number testing one or two or three years plus is approximately equal to the number testing the same amount minus. Where this fails to be the case only a re-arrangement of the tests is necessary to make it so.

The correlations of Binet mental age with school advancement are fairly high and with reservations may be taken as confirming the accuracy of the method. Too much stress must not be placed on this, however. We shall doubtless be nearer the truth to consider the tests a standard for determining the correctness of school grading rather than vice versa.

Abelson's careful statistical treatment of the data secured by the application of a series of mental tests, including a few taken from the Binet scale, demonstrated that the result of a single individual test (as for example the test of memory for sentences) has a slightly lower degree of reliability than the teacher's estimate; that the pooled results of two tests fully equal the teacher's estimate in value, and that the pooled results of eight or nine tests are incomparably more reliable.

Common observation does not give us definite or usable standards for judging the degree of brightness or dullness, and often leads to quite erroneous conclusions. A common error of the teacher is to overestimate the intelligence of the retarded child. This is due to the unconscious use of the same standard for all

the children in a class regardless of age differences. For example, eleven-year-old A. P. was in the low second grade. She was able to do the work of this grade, not well, but almost passably. Her teacher inferred from this that the girl was only a little less bright than the other children of her class. What she overlooked was that A. P. was being measured by a seven year standard, and that instead of being able to do second grade tasks independently she ought to have been equal to the work of the fifth or sixth grade. In reality she was a feeble-minded child with an intelligence of barely six years.

Another source of error in the teacher's judgment is the tendency to overestimate the intelligence of the sprightly sanguine child and to credit too little the intelligence of the child who appears slow and apathetic. On the other hand, no one has found the tests to be wholly satisfactory. This holds for most of the individual tests and for the scale as a whole. Though the Binet revision of 1911 represents in the main an advance over the scale of 1908, it is by no means perfect. Several of the tests, especially in the lower and upper range, are not correctly placed while others are either not well adapted to display intellectual differences or else give too much play to chance error in giving the test or interpreting the response. My data on about 800 children have convinced me that the revisions others have made in the placing of the tests and in the procedure are not radical enough.

One desideratum is to secure tests the responses to which will be least influenced by the ordinary differences among children in their intellectual and social environment. We cannot hope however to test intelligence apart from all environmental influences. Intelligence can only show itself in the acquisition of particular knowledge, particular skill, and the like, gained through particular experience. Intelligence can not work without ideas, and the nature and range of these depend partly upon accidents of environment. In our efforts to measure intelligence, therefore, we always measure intelligence plus a certain kind and amount of training. Nevertheless it is possible to choose tests the responses to which will not be greatly affected by such dif-

ferences in training and experience as are ordinarily found among the children of a fairly homogeneous civilization.

Dr. Kuhlmann has appropriately emphasized the fact that the susceptibility of a test to the influence of differences in training can not be judged from theoretical considerations. We can only rely on the statistical treatment of data gathered in such a way as to display the influence in case it exists. The various investigators, basing their judgment on mere inspection, general impressions and opinion, are far from agreed as to which tests are especially liable to this error; and Kuhlmann shows that some of the tests which all have criticized on this ground are less objectionable than certain others which had been supposed quite satisfactory. Much work remains to be done before we shall know the full extent of this error for the individual tests.

Again, it would be desirable to have a somewhat more representative range of tests. The scale is especially lacking in tests of that sort of intelligence which is most concerned with practical judgment in the manipulation of things, mechanical ingenuity, or what Thorndike has called "thing-thinking" as contrasted with "idea-thinking." There are many kinds of intelligence, and each should be given due opportunity to contribute to the total result of the test. No test taken by itself can be satisfactory and an "ideal intelligence test" is in the very nature of the case an impossibility. The only feasible method is to test a wide range of functions and pool the results.

#### **D. Special Sources of Error.**

As the scale now stands there are several sources of error. Chance, for example, plays too great a part in such tests as stating whether it is morning or afternoon, which of two weights is the heavier, which of two pictures is prettier, which of two lines is longer, giving sex, uniting the parts of a divided card (test of patience), distinguishing right and left, etc.

Another difficulty is that of scoring. There is much room for the personal equation in deciding whether the child has passed such tests as copying a square or a diamond, reproducing geometrical figures, describing and interpreting pictures, answering "questions of comprehension," giving definitions, etc. It is not

desirable to eliminate all such tests, but it will be necessary to define more carefully the conditions for giving them and to lay down rules which will secure a more uniform interpretation.

In fact, the procedure throughout the tests deserves more consideration than has generally been accorded it. Apparently very slight changes in procedure are capable of entirely transforming a test psychologically. For example, it is customary in the test of naming sixty words in three minutes for the experimenter to illustrate what is wanted of the child by himself naming three or four words. I have found that the performance is injured if the illustrations are chosen from unfamiliar or abstract words. Success in this test is also likely to be influenced by the immediate surroundings of the child. The test varies in difficulty according to whether the room is bare or filled with objects and bric-a-brac, whether it permits a view of the landscape, etc.

The distinction between such terms as "enumeration," "description" and "interpretation" of pictures has no significance unless the pictures are properly chosen and the procedure standardized. Some pictures provoke almost nothing beyond enumeration, even among older and very intelligent children, while others readily provoke description and interpretation on the part of young or retarded children. The series of pictures should be of uniform difficulty and should be presented always in the same order. Let us suppose that these principles are not complied with and that of the three pictures A, B and C, A and B tend to provoke description, and C interpretation. Now if the experimenter begins by showing A or B first, the habit of description is likely to be carried through the whole series.

On the other hand, if C is presented first, interpretation is initiated and tends to persist. The Binet series is by no means ideal for the purpose, nor is any other that I have seen. Experiments should be made for securing suitable pictures.

Likewise, in the test of definitions by use or superior to use I have found that there are words which even university students nearly always define in terms of use, while other words, like fork and chair of the Binet series, are usually defined in this way by children of four years. Some words are almost impos-

sible to define in a logical way, others easy. Accordingly, if the words used for the definition tests are not comparable with respect to the type of definition provoked special precaution in scoring will be necessary. In any case it is best, as in the case of the pictures, to give the words always in the same order.

The test of arranging weights is sometimes given by first demonstrating to the child what he is expected to do, the experimenter hefting the weights, etc. Others merely tell him what to do and leave him to find his own method. These are really two different tests.

And so we could continue indefinitely. A whole chapter could be written on the sources of error for each test. It is imperative for any one who intends to use the tests for psychological purposes or in the serious diagnosis of children to be cognizant of the many pitfalls. As Binet himself urged, the system of tests is not analogous to a nickel-in-the-slot machine. Its correct use requires patience to learn the exact procedure and a keen sense for psychologically important differences of response. Neither is likely to be found in a high degree in persons who have not had a laboratory training in psychology.

It is not at all necessary, however, to limit the use of the tests strictly to those persons who have had ideal training for their use. Even with the imperfect directions now available the intelligent physician, teacher, school nurse or parent can very quickly gain a better idea of a child's intelligence than would be possible from long observation. With the amplified and simplified directions which we may hope to have soon the use of the tests could be greatly extended, although only the psychologist is qualified to use it for psychological diagnosis and research.

In this connection we may mention the need of researches which will reliably establish the degree of accuracy to be expected from the use of the tests by untrained persons.

But whatever the scientific equipment of the person who uses the tests, there are many practical considerations which must be regarded. In the first place, it is essential to get into friendly rapport with the child before beginning the test. Self assurance must be strengthened by lavish encouragement. In

general, the worse the response the better satisfied one must seem to be with it. The room must be quiet. The test should proceed without any interruptions. The presence of others is ordinarily too distracting to be permissible. The parent or teacher especially must not be present. Demonstration tests before classes are usually highly unsatisfactory.

The order of the tests is important. The sitting should begin with tests which are interesting to the child and which tend to relieve the embarrassment of the situation. Especially suitable are such tests as give the child something definite to do which is not too foreign to his previous experience. Such tests as questions of comprehension, naming words, finding rhymes, rearranging words to make sense, memory for sentences, and the like are entirely unsuited to begin with. One must also guard against opening the examination with tests that are too hard, or with tests that are easy enough to excite the child's contempt or make him careless.

The tests should proceed rapidly. It takes some skill to jot down the responses as fully as is desirable without keeping the child waiting. The latter must be carefully avoided. The material should be placed where it will not have to be hunted for. If the test is properly conducted the child can be kept interested and at his best level of performance to the very end. Under no circumstances should any of the scoring be left until after the test. The jottings should be made with the least possible display of hurry and motion.

Too much care can not be taken to see that the child understands what is expected of him for each test. There is no limit to the multitude of misunderstandings possible. After testing hundreds of children, one still finds new examples of misapprehension. It is out of the question to place one's reliance entirely in a set verbal formula for giving the test, and additional explanations are often necessary.

But these must be given without in any way helping the child in his response. To avoid giving help would theoretically not appear difficult, but in my experience it is one of the hardest things for the amateur to learn. Indeed it is almost impossible



to impress this danger sufficiently upon untrained observers. One who is not familiar with the psychology of suggestion may help the child to answer test after test without being in the least aware of the fact. If teachers and physicians are to use the scale it will be necessary for the directions to state in great detail what may and what may not be said or done in the giving of each test, although one may hardly hope to devise a set of "fool-proof" instructions.

Another possibility of error is the psychical disposition of the child when the test is given. This will be unfavorable if the child has recently suffered alarm, anger, anxiety, etc., For example, the child arrested and brought into court for the first time is not in a suitable frame of mind for such a test.

Attention should also be paid to the state of health. Toothache, headache, earache, nausea, fever, a cold, etc., all render the test inadvisable.

#### **E. The Significance of Various Grades of Mental Retardation.**

Even if we had a perfect scale and applied it with every regard for correctness of procedure there would still remain the problem of arriving at a practical and psychological interpretation of the degree of retardation or advancement found. This, as Bobertag and Kuhlmann have emphasized, is no simple matter. What, for example, will probably be the mental age at twelve years of a child who was two years retarded at six? To answer such questions we must know approximately the curve of mental development for normal children and for children of different degrees of mental superiority or inferiority. We do not yet have sufficient data to enable us to construct such curves.

It is evident, however, that to indicate the degrees of retardation or advancement in years, as Binet does, will be misleading unless it is borne in mind that a year of retardation or advancement does not always have the same significance. The child of four years who tests out two years is retarded half his age and will probably not rise higher than the level of the imbecile, while the twelve-year-old who tests out ten is retarded to a relatively slight degree.

Stern has proposed to represent mental retardation or advancement by the quotient of mental age divided by real age. This is termed the Intelligence Quotient. This is no doubt an improvement over Binet's method, but as Bobertag has shown, this formula also probably needs correction. The best means of arriving at a valid method will be to test the same children at several different periods in their development and to follow their later histories.

The problem is not only one of great importance for the educational treatment of retarded or talented children, but is one of far reaching consequences for child psychology in general.

## THE BINET TESTS IN RELATION TO IMMIGRATION \*

BY H. H. GODDARD, Ph. D., *Vineland, New Jersey.*

I went to Ellis Island to see if the methods used in keeping out defectives could be improved. In that first visit, both Professor Johnstone and myself were much discouraged. We went home and said we didn't see how much could be done because of the great number that were coming in every day. There are about 5,000 a day, 29,000 in a week, and there are comparatively small facilities for handling them. I went again last spring, and was able to look a little more intelligently at it. It takes a second visit to any institution to get much of an idea of the institution. After getting back to the city, I wrote the Commissioner and said we would be willing to make an experiment. We returned on Saturday, but no immigrants came in that morning because of a fog on the Bay. About one hundred were ready to leave. We picked out one young man whom we suspected was defective, and, through the interpreter, proceeded to give him the test. The boy tested eight by the Binet scale. The interpreter said, "I could not have done that when I came to this country," and seemed to think the test unfair. We convinced him that the boy was defective. That was so impressive that the Commissioner urged us to come back on the following Monday. We did, spending the day there and trying some experiments. We placed one young lady at the end of the line, and as the immigrants passed, she pointed out the ones she thought defective. They were taken to the quiet room, and we proceeded to test them. She picked out nine, whom she thought were defective. The result was that every one of the nine were below normal, according to the Binet test.

Again the result was so striking that they asked us to come back later. Last fall, the young ladies were there a week and tested a great many. Indication from the data we had in hand,

\*Given at the meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

were that they were getting about ten per cent. of the feeble-minded immigrants who were coming in. The ordinary doctors were getting only ten per cent. while with the Binet scale it was possible to get ninety per cent. One reason why we had not taken up this work before was because it is exceedingly difficult to handle the Binet scale through an interpreter. We found many troubles before us. The interpreter was much inclined to say, "That is all right," when perhaps the questions were not answered just as they should have been. Another difficulty is that you cannot be sure that they translate your language correctly from a psychological standpoint. In order to get the best results, the interpreter should be trained in psychology.

The result, again, of that week's work, although the doctors did not fully agree with our conclusions, was that they were willing that we should come back to make further experiments. Last spring, we had the opportunity and the finances, and sent these two ladies there for three months.

After a person has had considerable experience in this work, he almost gets a sense of what a feeble-minded person is so that he can tell one afar off. The people who are best at this work, and who I believe should do this work, are women. Women seem to have closer observation than men. It was quite impossible for others to see how these two young women could pick out the feeble-minded without the aid of the Binet test at all. The doctors picked out all the defectives they could find. Then our examiners stood there and picked out quite a number and sent them back for reconsideration. I am rather strongly inclined to think that the physicians simply looked them over and said, "Oh, no! There isn't anything there." I am sure it would be a good plan to take the names and addresses of these people about whom there is any doubt, and try to look them up a year or two later. We could then see how many make good. Every one who makes good and becomes a useful citizen, will discredit our test; but every one who becomes a public charge, will confirm our diagnosis. We attempted to obviate difficulties by testing some we thought were normal. For instance, in the Bohemian group, we picked out some normal persons and tested them. The

doctors said they would not pass our test anyhow, but we found as a rule that they did pass the test. The Binet scale in the hands of experienced men or women will be of tremendous value in the immigration problem. Although not always correct, the number of defectives held at the Island will be more nearly so, even if the doctors themselves picked out many more cases than they are now doing. Our examination of immigrants at present is very defective. They have not money enough to do the work thoroughly. If the dozen physicians have to examine 29,000 a week, toward the latter part of the week these immigrants are going to get through easily. Because of this, one immigrant was heard to remark before they landed, "I hope we will get to Ellis Island on Sunday night."

Using the psychological method of examining the percentage of immigrants that would be picked out as defective would be much greater than now. The Binet test might be used even with immigrants.

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## DISCUSSION

Dr. Walter E. Fernald, Waverly, Mass.: We have found that from ten to fifteen per cent. of mental deficiency is due to some specific mental disease. Very few cases of actual mental defect begin after the age of three or four. Professor Goddard has called attention to the fact that by mere observation alone, his trained workers were able to pick out more mental defectives than the doctors. In our institution we had a boy who could read the daily papers, yet could not tell me the name of any of the towns around Stoneham where he had lived all his life. Another boy who came to me had lived near the St. Charles River. Yet he could tell nothing about it nor the surrounding country. These boys had no curiosity whatever.

The question as to what the boy has read is very important. If he has read no books, it is a very singular thing. A girl of fifteen told me she had never read a book except her school textbooks. The absence of knowledge and the absence of interest in that patient's environment led me to minimize the apparent stu-

pidity of that patient. This girl was put in a family where she had splendid opportunities. She attended church, was given many books to read as well as papers, and in a month's time she was a very different person. Asking questions regarding objects of common interest, such as "What did you see on your way to my office this morning? How long would you boil an egg? How long would you boil tea?" may enable one to get at the power of discrimination.

For many years, I made the statement that no feeble-minded person could do long division. But a teacher, from Vineland, I believe, convinced me that that statement was not true, by showing me a feeble-minded child who could work in long division. However, very few are able to do this. Their ability to do abstract, methodical work is very limited.

One day I thought I would test two of our employees in the use of abstract words. So I called in two men who were running lawn mowers. There was no question about the mentality of these men, but neither of these men could tell the difference between event and advent, happiness and honor, showing that the inability to express one's ideas in this way is not necessarily due to feeble-mindedness.

Dr. Wm. Healy, Chicago, Ills.: In the light of my very extensive experience, I will give you a cursory report. In regard to Court work, what does the judge or jury want to know? They want to know what can be predicted of the case. What can we say of his future career? In this work, we meet with many difficulties. Psychology has been termed the science of behavior; behavior interpreted in correct terms. Conduct is merely behavior. It is always the result of forces that are at work in our mental life. In studying groups of delinquents, one finds it necessary to study them from different angles. The Binet test is especially valuable in this work as it aids us greatly in classification. We find it necessary to study special abilities.

When our lives are adjusted steadily to one issue, then only do we become different individuals socially. This is immensely interesting from the standpoint of delinquency itself. There are

certain inhibitions at work. Things that come up are obsessions in the minds of these persons. One must know about the shocks the individual received. An individual who has recently been arrested is a very different individual after arrest than before. The individual after trial is a very different individual from the one before the trial. If hope is given, the individual is not the same. The complexity of the case is very interesting. I have recently studied the cases of one thousand offenders. I believe we find the most interesting cases in the poor grades. About seven per cent. of all offenders, taking the poor class, are epileptics, a very interesting thing from the professional standpoint. Of the thousand cases, 674 were distinctly above sub-normal, (67 per cent.) 69 cases of psychoses, 97 cases feeble-minded, 81 cases sub-normal, 79 cases dull—possibly physical causes.

The 97 cases of feeble-mindedness includes only a few imbeciles. The causes which we found are over use of alcohol, cocaine and narcotics, most excessive indulgence in bad sex habits, bad heredity, bad physical or mental environment, traumatism.

I gave the above figures to show the complexity of the cases with which we have to deal, and to show that the Binet tests aid us greatly. The Binet scale is of very great value in classifying these children when they enter an institution.

In closing, I merely want to say as I said to an Eastern Judge, there is nothing that offers the complexity that this problem does. The Binet test has a direct bearing on the point under issue, namely, delinquency.

Dr. C. S. Berry, University of Michigan: Under existing conditions I cannot see how we can be positive in our diagnosis of the higher grades. If we could get them for the ages of thirteen and fourteen, then we would be better able to diagnose them correctly. It seems to me we ought to supply tests for the higher ages.

Dr. Goddard: We recognize the inability of these children to handle abstractions. "What ought you to do when one contradicts you?" This question was asked by one of our examiners, and the answer was, "When I am right, I am right." I said to one of the patients, "Becky, what is a table?" "A table is to

eat on." "Becky, What is a mouse?" "I do not know." She could not think of any use for a mouse. We have that fundamental fact. These people cannot deal with abstractions, and this accounts for some of the errors in the use of some of the tests. These tests for fifteen years we might as well discard because we have all found that they are not reliable. They do not test the relative mental development. I can see that the human mind at about the age of twelve normally begins to specialize. If he does specialize you will call him a genius, if not, a moron.



## SOME TYPES OF MENTAL DEFECTIVES\*

BY WM. HEALY, M.D., *Chicago, Illinois.*

There are individuals who do not accord with any special type. Many judges, teachers and social workers are called upon to decide types. Most of these are interested in the Binet scale, although we have used a great many other tests. We have used the 1911 series in order that our work may accord with the work at Dr. Hardt's institution. There are certain types which one meets outside of an institution which are difficult for diagnosis.

I. I have been interested especially in the epileptic type. Today, he is absolutely irresponsible and uninterested; hardly knows his name. If seen tomorrow, there is a large difference; he is alert, observing, interested, and responds to tests well. He doesn't accord with any type of mental deficiency. The epileptic is an individual who is incapable; one thing one time, and another thing another time. Practically seven per cent. of all offenders are epileptics. A very large point, in my mind.

II. Then we have the feeble-minded type generally recognized as socially unfit. We recognize as feeble-minded anyone who doesn't pass the twelve-year Binet test. Musical ability is one of the most constant traits found in this class of mental defectives. A person may be a genius along certain lines and still be mentally defective. We have illustrations of this in some great mathematicians. In accordance with our definition of feeble-mindedness the border line individuals are called sub-normal.

III. A girl of sixteen years does the ten-year tests. In the twelve-year tests, she passed the third; in the fifteen-year tests, she passed the first. She is unable to take care of herself and is a pedagogical problem. Her general information is exceedingly poor. She claimed she went to the seventh grade but it is very doubtful if she did. On the simple construction test, she did

Given at the meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

very poorly. The point I wish to make is right here; this girl passed beyond the twelve year tests, but does not come anywhere near the twelve-year standard. This girl promised a man that she would not go anywhere near the red-light district as long as he was anywhere around. This individual is not up to par, but still she passed the Binet test of twelve years.

IV. The next type is the foreigner. Here is a case of a little Italian lad. Dosen't know our language very well. Has been in this country two years. Is peculiar. I have seen him repeatedly with one of the government interpreters. He is twelve and a half years of age. Has some very peculiar social traits. Interpreter stated, "I do not think for a moment you will understand this boy unless you go into his home." We must interpret such a case in the light of his family. We cannot understand him unless we do. In the Binet scale, he passed the seven-year tests. In the eight-year tests, the first and second were failures, and the others were passed. In the nine-year tests, the first was passed, the second was a failure, the third was a failure, the fourth and fifth were passed. All of the ten-year tests were failures. He has attempted suicide once. His father is of that peculiar type. The boy beats his head against the wall when he is angry. Not sure of diagnosis at all; need to see him a year from now. If we study these children over a prolonged period, we get better results.

Two other children are of a rag picker. Parents do not know their ages. Were seen in their environment. One becomes a lawyer by change of environment. In a case of this kind, one hesitates about making a final diagnosis. One wonders if the individual is not suffering from a general mental disability due to the physical condition. It is necessary to put together these physical conditions in order to get a fair diagnosis.

V. Another boy who does all of the eight-year tests was refused admission to the grade in the public schools in which he belonged because he could not do arithmetic. In everything else he was practically up to his age. Defective in a certain line.

VI. That of the so-called verbalist type. A Russian Jewish girl; out and out defective. Could write and read in four lang-

uages. We wanted to deport her but were unable to do so. The whole judgment in the court room was based upon her ability to handle the languages. We tried to have this account published, but the clinical journal doesn't care to take this kind of matter for publication.

Another case was that of a sixteen-year-old boy who cried while selling gum. The tear ducts were closed, which caused the tears to flow down his checks, so he could shed tears very easily and made much money selling gum. After a few years, he got into court with his father and we had a good chance to examine him. He has the most exceptional conversational ability. Is a fluent talker. Has a fair voice and sings right well; sings in saloons now. We have heard him sing several times since. Can still shed tears. This boy talked himself out of court, which proves that his type is difficult to handle in court work. The Binet tests are good to have for any court work, or at any time a child is troublesome in school work.

Here is another case of a Russian Jewess, decidedly pretty. Knew French and spoke with an accent. This girl stayed in the lobbies of theatres and cried. Rich people who saw her had sympathy for her and often bought a ticket for her. Finally she met a man whom she asked to come and live with her for two weeks, which he did. This girl is acting as a living picture in a theatre now. Has gone the way of the red light district. We could not deport her. In eighteen months she picked up English very well, spoke German fluently, and had some French. She had done well in the lower grades in school; had all sorts of ambitions and later took examination to become a pharmacist.

VII. Another type, an individual who is subnormal to start with and later has superimposed psychoses. For instance, a girl acts in an insane way; indulges excessively in bad sex habits. It is a very difficult matter to know where to put her. How much of her mental aberration is due to her habits? She was sent to the institution for Delinquent Girls, and they sent her back to the courts because of her excessively bad habits, and for the same reason, I would not send her to an institution for feeble-minded. She was finally placed in an institution for old girls,

although we did talk of sending her to the State Hospital for Insane.

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## DISCUSSION

Dr. Fernald, Waverly, Mass.: What would be the mental age of the case you spoke of under Type III if she passed the twelve-year test? What would you reckon her, Dr. Goddard?

Dr. H. H. Goddard: The whole thing is absolutely arbitrary in its interpretation. Our experience shows that she is a deficient girl. The difficulty as I see it, is that you are assuming that the Binet scale is some kind of a yard-stick, and you are laying the material down on it and measuring it off. The Binet scale is a means to an end, to help interpret. A girl who does the things this girl does should never be considered as passing the Binet scale. The fact that she had trouble in passing these tests shows that she is a deficient girl. No one contends that the Binet scale is absolutely correct in itself and that it should be taken alone.

Dr. Healy: The Binet scale does not tell the whole story, just the point I want to bring out.

Mrs. Creswell, Grand Rapids, Mich.: What is done with such a case as the eleven-year-old girl you spoke of under Type IV?

Dr. Healy: I have kept her under observation for a year. Miss Smith is making a survey in the sub-normal rooms, and has several of these cases under observation. Whether defectiveness is due to deficient environment, or whether they are merely concomitant is difficult to decide. One confuses diagnosis and prognosis. There is a difference between retardation and practical sense. One does not want to do the individual an injustice.

Mrs. Creswell: Is it true that having been in an institution, does actually no harm to the child?

Dr. Healy: This I have known. A jury failed to settle a case because they learned that the person had been an inmate of a home for feeble-minded. The fact that they have been there influences the judge as well as the jurors.

Prof. E. R. Johnstone, Vinleand, N. J.: Is it a possibility for one to have once been in an institution for mental defectives and still retain no social stigma?

Dr. Healy: If you looked up a person and found in his past history that he had been in such an institution, would you let that influence you in your judgment? I do not think it should be so, but it unfortunately is.

Miss Grace M. Bohne, Rochester, N. Y.: We find many of Type VI. in our school work. The teachers are unwilling to accept excuses for deficiency because these children are fluent speakers. One girl in particular was not quite old enough to go into a vocational class. Was of low mentality, but very anxious to enter a vocational class. She finally went to the superintendent and told him she was going to commit suicide if she could not enter the class. She pleaded her own case, and was placed in the class.

Dr. Healy: A very beautiful case of this type.

In the case of defectives who are deficient in self-control, we often find that the parents as well as the child are defective in this way. However, I would go back of this and ask "What about environment?" How about the training in those cases? How can we fairly draw conclusions unless we know the conditions of the home? We seem to have evidence that individuals who have lived away from parents have a tendency to eroticism. The whole question of the moral imbecile is one of an individual who has or has not intellectual defect and yet has not normal moral capacity. I have been on the look-out for years for such an individual, but have never found one. The consensus of opinion is that it is a question whether a real moral defect alone ever exists.

Dr. H. H. Goddard: When it comes to a matter of a test of intelligence none of us are near understanding what intelligence is. I do want to say that it is something vastly more than knowledge. We make a serious error if we confuse intelligence with merely knowing. It does include this matter of inhibition. One charming writer has given what seems to be a satisfactory definition: "The sum total of all the powers or

processes by which the individual is able to adapt himself more or less perfectly to his environment." His intelligence is incapable when he tried to adapt himself to his environment, being capable of adapting himself to a simple environment, but not the environment in which we would place a person of twenty or twenty-five. Dr. Healy's first cases show enough to make us know that we would not have known these cases if we had not had the Binet tests. I agree fully with Dr. Healy that a moral imbecile, as formerly defined, has not been found. The difficulty is, I think, that the defect is less than we have been in the habit of counting on. There are a great many such cases which are particularly peculiar. We have not learned to eliminate those factors from our problem, and there may be something of a hereditary nature, or some of these other matters in these cases which do not conform, which test about twelve or below, and to all outward appearances are normal. I believe fully that when we get to these points, we will find that the Binet scale tests intelligence, but that we cannot absolutely rely upon the findings.

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## REVIEWS AND NOTICES

Die Intelligenzpruefung nach der Methode von Binet-Simon in ihrer Bedeutung zur Erforschung des Schwachsinnns bei Schulkinder. DR. ERNEST BLOCK. *Zeitschrift fuer die Erforschung und Behandlung des jugendlichen Schwachsinns auf wissenschaftlicher Grundlage*. VII, 4, 1913. Pp. 272-288.

The author tested seventy-one children of the Hilfsschule with ages from eight to fifteen years, using the 1908 scale. He compares the results for each test with what normal children can do, or are supposed to do, with the idea of showing in what particular mental functions and abilities the backward children especially lack development. In this connection he points out beforehand that the principle of the tests is that of omitting the testing along the line of school tasks and testing the different mental func-

tions. He then enumerates the different tests for each mental function. In this opinion the author is undoubtedly mistaken. Binet and Simon distinctly did not set out to devise tests for the different mental functions. Numerous efforts have been made to do this, without success, because we have, as yet, been unable to isolate them sufficiently in any tests. There has always been dispute among psychologists as to what mental functions certain tests test most, and there would certainly be no agreement on Dr. Bloch's arrangement of the Binet-Simon tests according to the mental functions he thinks they test. His finding, however, on what particular tests the children of the Hilfsschule fail more than on others are valuable, irrespective of whether or not we interpret them as he does. He finds the following tests particularly useful in detecting feeble-mindedness, because the backward children of the Hilfsschule showed a special inability to pass them: (1) Repetition of five numerals; (2) naming of coins; (3) arranging five weights; (4) recall of story read; (5) copying written phrase; (6) writing from dictation; (7) naming the days of the week and of the month; (8) giving the date; (9) comparing two objects from memory; (10) distinction between morning and afternoon; (11) questions on comprehension. He notes that these involve, in the main, tasks of everyday life. He finds the tests very accurate, agreeing, with very few exceptions, with the observations of the teacher. A general inference that he draws from his results is that "the mental development of the feeble-minded on the whole follows that of the normal child except that it is retarded, on the average, from two to four years, and that it stops entirely at a much earlier age."

Faribault, Minnesota.

F. Kuhlmann.

## NEWS AND NOTES

Readers of this Journal will be interested in a new periodical devoted to the practical application of the results of the scientific study of the child, the "Revue de Pedotechnie," edited by Dr. Decroly, and published by the "Societe belge de Pedotechnie, avec la collaboration de l'Institute J. J. Rousseau, de Geneve." It will appear in six number a year, beginning with October-November, 1913. While its aim is that of furthering the practical application of the results of child study, it will publish results from the latter field as well. The first number contains articles on the value of school marks, by Ed. Claparede; Homogeneous classes and the mental examination with the Binet-Simon tests, by Dr. Decroly; the child and the moving pictures, by Vital Blas; and the education of the senses, by A. Herlin. The "Revue" will undoubtedly from time to time contain matters of interest to readers of Psycho-Asthenics.



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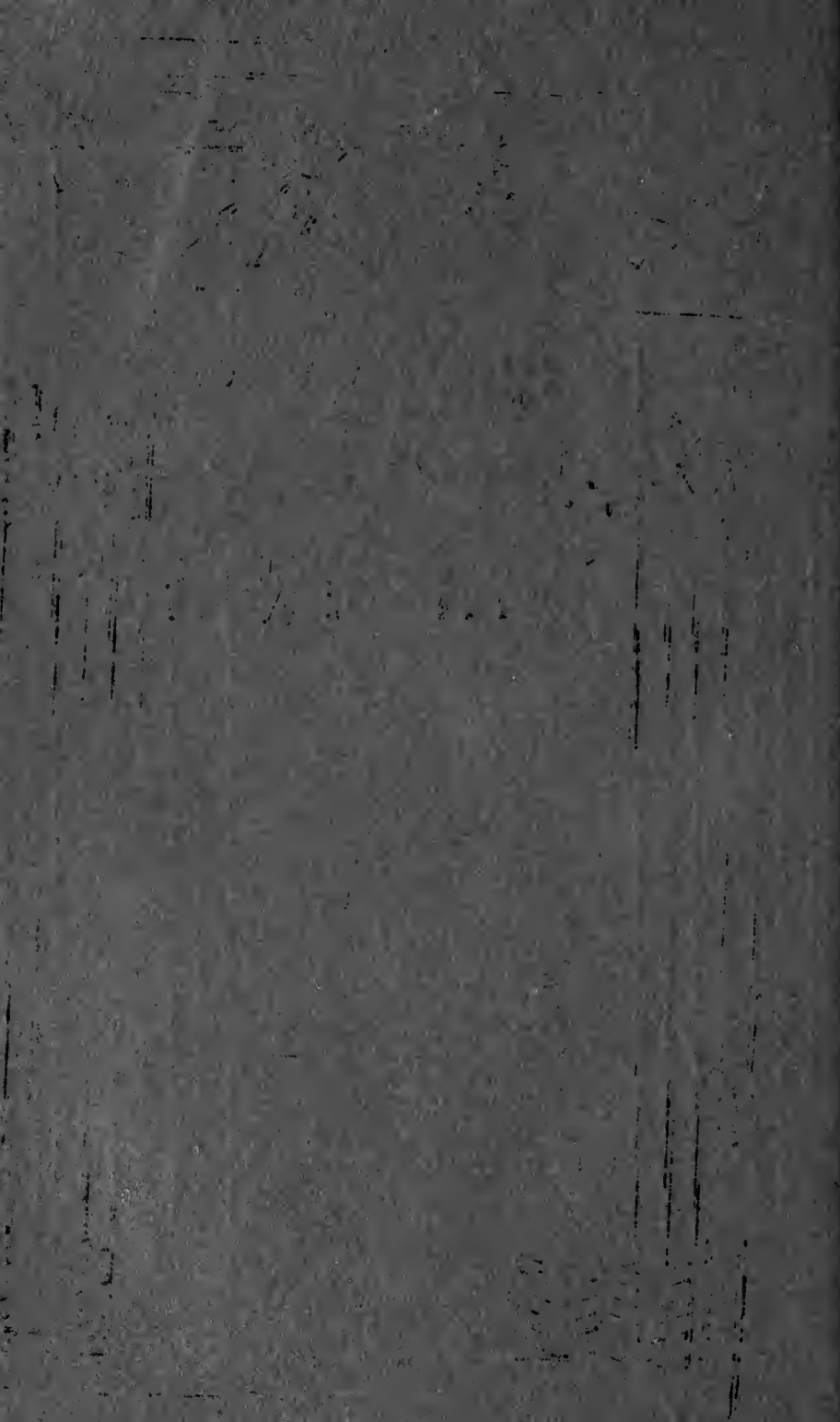
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## THE SIGNIFICANCE OF INTELLIGENCE TESTS FOR MENTAL HYGIENE\*

BY LEWIS M. TERMAN, *Associate Professor of Education,*  
*Stanford University.*

Mental hygiene, like physical hygiene, has come to mean much more than the prevention of disease. Its function is positive as well as negative. Between the high level of perfect mental functioning on the one hand and mental disease on the other there are many intervening grades of efficiency. These levels are not necessarily the same for any two individuals. Each has his own range. It is the task of mental hygiene to bring to bear upon the mind all those influences which are capable of raising the level of its functioning, as regards either intellect, or emotion or will.

The fulfillment of this task presupposes not only a knowledge of the general laws of mental activity in the various stages of the life cycle, but a knowledge also of the special limitations, special dangers, special capacities and idiosyncrasies of individual minds. Any scheme of mental hygiene must therefore be based equally upon general psychology and differential psychology, the latter term designating that branch of psychology which seeks to understand the individual mind with reference to those traits which differentiate it from other minds.

The contribution of mental tests to both of these branches of psychology is one which is constantly growing in scope and

\*A paper presented before the Division of Mental Hygiene, of the Fourth International Congress of School Hygiene, Buffalo, August, 1913.

intrinsic value. In fact, the rehabilitation of mental tests from the general disrepute into which they had fallen is probably the most important psychological event of the last decade, an event whose significance is not yet sufficiently appreciated. Graded tests for the measurement of intelligence, after the method of Binet, and tests for the exploration of association types and "mental complexes," after the method of Jung, are especially rich in possibilities from the point of view of mental hygiene. It is the purpose of this paper to suggest a few such possibilities.

1. Thus far the Binet tests have been valued chiefly as an improved method for the exact grading of the degrees of deficiency present in feeble-minded children. Their value for this purpose is two-fold. In the first place, it is necessary to establish the degree of defect before it will be possible to decide intelligently upon either the content or the method of instruction best suited for the training of a backward child. In the second place, intelligence tests are rapidly and properly extending our conception of "feeble-mindedness" to include milder degrees of defect than have generally been associated with this term. The unpsychological and wholly unscientific methods of diagnosis used by physicians, if we can dignify their usual guess work procedures by the term method, overlook the large majority of higher grade defectives. The low grade moron was about as high a type of defective as the physician was ordinarily able to identify as below normal. It is safe to predict that within the reasonably near future intelligence tests will bring tens of thousands of these high grade cases under the surveillance and protection of society. This will ultimately result in curtailing the reproduction of feeble-mindedness and in the elimination of a vast amount of crime, pauperism and industrial inefficiency. It is hardly necessary to emphasize that the high grade cases are precisely the ones whose guardianship it is most important for the state to assume.

2. In addition to the usually recognized burdens imposed upon society by the presence of a large number of mentally defective individuals, there are other costs which are sometimes



overlooked. As an illustration we may mention the possible influence upon the intellect and moral habits of normal children from constant association in the home or school with feeble-minded persons. It would be unreasonable to suppose that the sensitive imitative, absorbent child would escape injury from such intimate association with inferior and infantile mentation. The crude intelligence, obtuse morals and unstable will of the feeble-minded tend inevitably to affect unfavorably the quality of mental functioning in the normal people associated with them. For children, particularly, mental hygiene demands a better model.

Under present conditions there are few children who altogether escape contact with feeble-minded persons. There must be at least one-half million normal children in the United States who live in families where feeble-mindedness is present. Besides the direct injury wrought upon normal children by each contact there are several unfavorable indirect results. The care, medical attention, educational effort and economic resources wasted upon the feeble-minded would bring far greater returns if expended in behalf of normal children or in the intensive cultivation of genius.

3. The use of mental tests is fast emphasizing the extent of the individual difference to be found in the intelligence of children who are well above the borderline of feeble-mindedness. "Genius," "talent," "dullness" are terms whose content is being greatly enriched. Hygiene demands that the school shall take account more seriously than it has yet done of the existence of individual difference in the ability of its pupils. Too often faulty methods of classification place pupils where they cannot get normal returns for their efforts. The genius and the dullard are too often chained together in the same lock-step. The discouragement resulting from ineffective or only partially successful effort, as in the case of the retarded pupil, may be the starting point for life-long inefficiency.

The most important aspect of retardation is its bearing upon mental hygiene. When the child approaches for a second time the school work in which he has once failed it can hardly be

with other than a drooping spirit. Recent studies in psychopathology have greatly extended our idea as to the importance of the emotional factor. The feeling of self-distrust and diffidence often engendered by repeated failure is the most constant symptom of that condition of volitional ineffectiveness known as psychasthenia. If it is important for the adult to find a successful outlet for his energies and to experience to the maximum the feeling of accomplishment and triumph, for the child this is imperative.

On the other hand, when the school work is too easy, as it often is for the talented child, there is danger of an intellectual slump. For lack of being recognized and fed genius is often effectually starved. By being kept over-long at what is easily acquired the mind becomes prematurely arrested, enslaved by habits of inferior activity.

In the light of recent development, however, we may now confidently look forward to the development of clinical methods of mental examination which in time will result in the more scientific classification and instruction of the genius, dullard, emotionally abnormal or otherwise peculiar pupil. Our school work with all these classes has been carried on in the dark. If light comes, it must come through the development of differential psychology, the chief method of which must always be mental tests.

4. Reliable tests of intelligence will enable us to promote children largely on the basis of intellectual ability. The information standard for promotion will be replaced by the criterion which asks merely that the child shall be able to do the work of the next higher grade. Hitherto the school has had to rely chiefly on the information standard for the simple reason that reliable means for determining intelligence have not been available.

If mental tests prove feasible for use in the place of the ordinary school examinations they will render a notable service to school hygiene. Investigations like those of Serafani, Ignatieff, Koginoff, Graziano and Helwig are in point here. Ignatieff, for example, in a study of the effects of a four weeks' ex-

amination period on 242 pupils in a Moscow military school found that seventy-nine per cent. lost weight during the month and that hardly any made the gain normal for children of the age in question. For thirteen of these pupils the vacation of three and a half months which followed the examination was not sufficient to make up for the loss of weight suffered during the strenuous pre-vacation period. Ignatieff concludes that in its physical effects the prolonged examination is comparable to a severe illness, and that a mental strain severe enough to cause such profound alterations in metabolism could hardly fail to affect unfavorably that organ most concerned in the overpressure,—the brain. The results of Serafani and Koginoff are similar to those of Ignatieff.

The hemotological studies of Graziani and Helwig on the effects of protracted mental strain upon the composition of the blood are even more decisive. The former subjected eighteen university students and seventeen children to blood tests before and after the usual school entrance examinations and was able to demonstrate a decrease in hemoglobin amounting on an average to ten per cent. with the students and seven and four tenths per cent. with the children. The red corpuscles, although apparently not affected in number, showed changes in the power of resistance much the same as other investigators had demonstrated as resulting from weak poisons.

Results of this kind could be quoted from other studies. The use of school examinations in the estimation of mental ability should be discontinued and replaced by brief, interesting and non-injurious mental tests. The latter are not only more hygienic; they are also infinitely more accurate and enlightening.

5. The development of differential psychology through mental tests is probably destined to play an important role in the work of vocational guidance, and vocational guidance is a large factor in preventive mental hygiene. The instinct of workmanship is one of the most generic of human motives, and when given a suitable outlet it is one of the most satisfying. There is little hope for the neurotic individual who is not successfully engaged in useful and interesting work. Hysteria is pre-eminently

a disease of the unemployed or the aimlessly employed. A fruitful and interesting occupation engages and practices the synthesizing powers of will, unifies the personality and prevents disagreeable and submerged "complexes" from producing their effects of mental disintegration.

While we are not yet in position to draw up the outlines of the psychology of vocational guidance, it is already evident that intelligence tests were destined to become an indispensable tool for the vocational counselor. When thousands of children who have been tested by the Binet scale (or by other standard tests of intelligence) have been followed out into the industrial world and their success in various occupations noted, we shall know pretty definitely the vocational significance of any stated degree of mental retardation or advancement. Researches of this kind will ultimately establish the minimum **intelligence quotient**\* for success in each leading occupation. We are in urgent need of usable tests which can be given to children by groups, thus making possible the official registration of an intelligence quotient for each individual child. It would then be possible to lay before each child at the end of his school course an array of occupations in which (as far as intelligence is concerned) he might reasonably be expected to succeed. Tests of other mental and physical traits will no doubt be available in the comparatively near future.

6. Those who inhabit our hospitals for the insane were but a little while ago pupils in our schools. In view of the functional origin of certain insanities, these must be looked upon as largely preventable. Mental disorders which yield to the method of re-education could even more easily have been prevented altogether by right education. But what will pass as right education for the normal child may not be best adapted for the child of neurotic tendency. Hence the need of psychological methods which will enable us to identify such children early in their development. At present surprisingly little is known of pre-hysterical or pre-psychasthenic states, etc. After these have been more thoroughly analyzed it ought to be possible to devise tests which would determine the presence or absence of the traits in question.

\*Intelligence quotient equals mental age divided by real age.

In this connection one thinks naturally of possible uses of Jung's association method, psycho-analysis, etc. If "emotivity," in Janet's sense, has the symptomological importance attached to it by that writer effort should be made to construct tests which would reveal its degree and nature in the individual child. The prodromal symptoms of mental disorder once discovered, precautions could at once be taken to guide mental functionings early into the paths of normality. The method of re-education is slow and its issue doubtful. It will be more effective to manage the work of education in such a way as to render re-education unnecessary. All the school's activities must be judged by the contribution they make to mental hygiene in the broad sense.

7. Mental tests are aiding us to understand better some of the moral peculiarities of children, and the moral life, it hardly need be said, is full of possibilities for mental hygiene. We recently learned that an astonishing amount of juvenile delinquency and adult criminality are the result of feeble-mindedness. Nearly half of those punished for their wickedness are in reality paying the penalty for their stupidity.

This is true even of school punishments, as appeared in Kemsies' statistical study of this subject. The sixteen per cent. of the pupils ranking lowest in ability received eighty per cent. of the punishments, while the brightest one-third of the children received almost none. How much wiser it would be in such cases to substitute educational treatment founded on a psychological understanding of the factors involved than to resort blindly to the method of beating.

8. It is necessary for the school hygienist to know as exactly as possible the weight of every external factor which influences physical and mental development. The essential task of school hygiene is that of guarding the growing child against influences which would affect growth unfavorably, and as long as these influences have not been sifted, weighed and measured school hygiene has no solid ground to stand on.

When one searches the literature of school hygiene for evidence of the supposed injurious effect upon mental efficiency of decayed teeth, oral sepsis, reduced sleep, obstructed breathing,

bad ventilation, insufficient exercise, malnutrition, et cetera, one is met by endless assertion painfully unsupported by demonstrated fact. As a matter of fact we know next to nothing about the mental effects of any of the factors named. Ayres' finding to the effect that children with badly neglected teeth require an average of one-half year more time to complete the eight grades, may be interesting, but it proves nothing in the way of a cause and effect relation. It has been assumed that a large proportion of school children constantly have their faculties more or less clouded by lack of sufficient sleep. But so far no correlation has been demonstrated between intelligence and hours of sleep. The study of mental fatigue languishes for lack of unequivocal tests of mental efficiency. We do not know even how much truth there is in the universal belief that adenoids cause stupidity. As for ventilation, millions of dollars are expended annually on the assumption that mental and physical dangers are warded off in this way. But our positive knowledge as to the supposed stupefying effects of foul air, high temperature, etc., is very meager indeed.

It is not our purpose to deny such influences, but merely to point out that our best current literature on these topics offers nothing more substantial than supposition. When tests of mental ability are sufficiently refined, influences of this kind will be easy to detect if they exist. It will be necessary, however, for experiments with this end in view to be rigidly controlled. Tests carried on without a control, as was the case in the Cleveland oral hygiene investigation only add to the confusion.

Again, the influence on mental development of early instruction (vide the Sidis case), the supposed general effects of special training (problem of formal discipline), the influence of age, sex, and heredity are questions of the greatest import for mental hygiene, and questions also which can hardly be satisfactorily cleared up without the use of more refined mental tests than we now have. The proper use of mental tests would have told us, for example, whether the recently exploited "wonder children" owe their precocious intellectual prowess to superior training or to native ability. Mental tests will inform us whether the so-called

inferior races are really inferior or merely unfortunate in their lack of opportunity to learn. They will be able to give us meaningful norms of intellectual performance for different ages and thereby enable us to prevent the waste of untimely instruction.

In short, mental hygiene, being as broad practically as education itself, has need at every step of data which can only be supplied by the further elaboration of mental tests.

## RACE BETTERMENT\*

BY VICTOR C. VAUGHN, M. D., *University of Michigan.*

There is some hesitancy on my part in talking to experienced men and women who know a great deal more about race betterment than I do. In the first place, I believe that man is an animal and nothing but an animal. If there is anything supernatural, we might as well fold up our hands. I am dealing with this subject from an ethnic point of view, and not in a religious sense.

Races and known empires have come into existence, have developed a civilization, have gone into decadence and have passed out. We may gain something by inquiring what are the causes of race decay. Concerning the deterioration of the races of the far East, we know very little, but we do know something of the Greek and Roman civilization. A few years ago, an eminent student of Greek and Roman civilization, in connection with Dr. Ross, a great authority on malaria, made out a pretty clear case, not with absolute proof, that Greek civilization declined because of the introduction of malaria into that country. That country was held in bondage for nearly two thousand years—only within the last ten years has that country been free. I have a friend who has made a study of Italian dialects and he found that there are ninety dialects in Italy today. People of one locality can not understand the people who live in the neighboring localities. He has divided Italy into provinces according to the dialects spoken. The map is exceedingly interesting. He pointed out two towns seven miles apart where the inhabitants of one town can not understand the language spoken in the other. This is due to the fact that malaria swamps practically surround these so-called provinces. The people think that only evil spirits reside in such localities. Suppose that the counties in Michigan were separated from each other by malarial

\*Read at the Meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.



swamps, and then we would have some such condition in Michigan. No doubt malaria has been the cause of race decay.

Another cause of race decay is acute infectious disease. Herbert Spencer taught that acute infectious diseases are a good thing in the long run, because they kill off the people who ought to die, and in trying to prevent these diseases, we are saving people who ought to die off for the good of the race. We have in the writing of Plautus and others of that time, accounts of the prevalence of the bubonic plague, typhoid or typhus fever, and possibly instances of smallpox. When I began the study of typhoid, (and I think the opinion is held by some still), we thought the people who had typhoid fever would be the weak, the weak and the young would develop typhoid fever and be more likely to die from it than the strong and vigorous. We had not gone very far, however, before it was plainly evident that our ideas were wrong. In studying the sections of the United States army stationed in the South before the last war began, we found that out of about seven thousand men who were frequently on the sick report, about one in twenty developed typhoid fever. While I am not giving the exact figures, they are approximately correct. Out of 20,000 men who were never on the sick report, the number was about 16 per cent. so that the men who came down with typhoid fever were the men who were robust and vigorous. There are several reasons for this. The men who were strong and vigorous were sent out through the country and ran many chances of getting typhoid fever, while the men in the hospital did not run that chance.

Owing to the fact that more men than women have typhoid fever, some authorities think it is a matter of sex. This conclusion is unnecessary in the light of today. The fact is more men than women have typhoid fever because they are more often exposed to it. I have five chances of being infected to my wife's one because I run up and down the country, drinking all kinds of water while my wife drinks only boiled water. The strong have more chances of being exposed than the weak. We find more cases among young adults than children. Therefore, the percentage of those who were frequently on the sick list is not so large, and the mortality is not nearly so great.

We thought this was a discovery we were making, but found it was not a discovery but rather a re-discovery, according to records of typhoid or typhus fever more than one hundred years ago. It is stated in these records that among the strong and vigorous, the mortality was greater than among the weak and sickly.

The point I want to make is this: Acute infectious diseases do not improve the race; do not kill off the weak and unfit. They kill off the strong and vigorous. So acute infectious diseases have been one of the causes of race decay.

We have race diseases which harm the body both physically and mentally, another cause of race decay. These diseases destroy the strong and vigorous and leave the unfit to procreate their kind. Another friend of mine has been studying the decline and fall of the Roman empire for a number of years, and quite independently has come to the conclusion that the decline and fall of the Roman empire was due to acute diseases such as malaria fever.

Another cause of race decay is the intermingling or intermixing of different blood, producing an undesirable progeny. The Eurasians of India, the mulattos of our own country, and the mixed races of South America and neighboring islands are unanswerable arguments against race mixtures. The bad of each side becomes dominant, and the mongrel, whether man or beast, is no credit to the pure blood on either side of the house.

Another cause, and possibly a true one, is urban life in contradistinction to country life. This is probably more true of the past than of the future or present. Great nations such as Babylon, Ninevah, Carthage, and especially Rome constituted separate empires. In some of these, Rome for instance, slaves were brought in. They intermingled. The owner cohabited with the slaves, and consequently there was a mixture of blood. The inhabitant of Southern Italy is a mongrel and a mongrel isn't worth much. This holds true among the races. The inhabitant of Southern Italy is a cross of the negro. This mixed race finally married with the white race and we see the mixed race we now have. The Lombards in northern Italy are pure

Germans or Tutons still. They differ in wealth, differ in mental vigor, and differ in every respect. I will push my statement farther and say that the result of the intermingling of races in India is far superior to that of the Hindoo. This is proved in the results of the civil service examinations and the office holders in India. I would refer you to the races farther south, for instance Cuba and South America. They can not govern themselves, nor will they be energetic enough to take care of themselves and keep from having the diseases which reduce mankind both physically and mentally.

Epidemics not only destroy life but are brutalizing in effects. In the Sixteenth Century, plagues spread over Europe and killed one out of every four inhabitants. But there is a worse side to the picture still. Not only one out of every four died, but the whole of Europe was brutalized. Man reverts in the face of disease, to the savage, not only so far as he is physically concerned but mentally. We learn these things from history. Acute infectious diseases kill off the strong and vigorous and the intermingling of races leads to the deterioration of the two. Urban life probably has some effect. Where civilization has been more permanent, there has been comparatively little urban life.

What I have said is simply a prelude to what I want to say. I want to present the matter to you and get your opinion about it. We are all largely interested in race betterment. We are working largely without co-operation. There is a little army here and another army there; one trying to stamp out tuberculosis, one trying to improve the water supply, another interested in the feeble-minded, another in insanity, epileptics, etc. It does seem to me it is time that all got together and fought the battle in a scientific way. How can that best be accomplished? You can fill all the asylums for the insane; you may have all the juvenile courts you wish, but we must get back of these to reach the desired ends. Juvenile courts do great things, but juvenile courts can not touch the boy or girl until complaint has been made. Many of the complaints are made by neighbors, half of them through spite. Some one wants the boy sent away to spite the parents. We should find out some way to reach the

boys and girls before this happens. Judge Hulburt tells me there are hundreds of families in Detroit where the father and mother send the boy or girl out on the street with ten cents, or some such amount and say to the child, "You must bring back as much more." That is the condition of affairs. In order to avoid punishment the child procures the money in a dishonest fashion, gets caught at it, and is brought to the juvenile court. There are thousands of homes where it is impossible for the child to grow into a healthy, valuable citizen, and these homes are not confined to the large cities. They are scattered through the small cities like Ann Arbor, and Ann Arbor is no worse than many other cities of the same size. There are girl prostitutes who are taught prostitution by their mothers, sex perverts made so by their mothers. A man was sent to prison for cohabiting with a girl of fourteen years of age, and the man had been procured by the mother. There are thousands of children in the public school under ten years of age who are masturbating, who are becoming sex perverts. How are these influences to be reached? We must go back of the school, back of the juvenile court, must go back of state institutions and reach the home in which these children are growing up. Many children are growing up in homes where it is absolutely impossible for them to develop into good citizens. I am not a pessimist. I am an optimist. I would not like to live if I were a pessimist. I believe, however, that there are more people in homes for delinquent and defectives than there are in the Agricultural Colleges, Universities and Normal schools, in all the schools for higher learning.

The relation of heredity to crime is a complicated problem, and one which remains without satisfactory solution. All authorities on the subject say that some are criminals by descent, but to what extent the criminal tendency is inherited through the germ plasm, and how much it owes to environment, it is difficult to say. That we have in our population the greatest proportion of criminals of any civilized country has been asserted by some of our greatest jurists. Wier says that in this country, "250,000 persons whom the law never touches are engaged in systematic pursuit of crime who have no other occu-

pation. There are four and one-half times as many murders for every million of our population today as there were twenty years ago. Ten thousand persons are murdered in this country every year and of the murderers only two in every hundred are punished." The causes of this sad condition are variously interpreted. No less an authority than ex-President Taft thinks it in part at least due to defective administration of the criminal law, that crime is more frequent in this country than in other civilized countries. How can these causes be removed?

It is a question whether immigration has anything to do with it. In some sections, they find more feeble-minded, more delinquents among the native population than among the foreign. Testimonies vary greatly along this line. It depends upon the locality where the observation is made. Some say that the only way to have a good race is to have pure blood, not mixed; and just now we are in a kind of popular wave of admiration for the way in which the Russian Jew has developed in this country. We say that the Jew is the purest blooded race in the world, although some Jews deny it, and say they are a mixture. I do not know anything about the relative prevalence of insanity and feeble-mindedness among them, but I do know they are less liable to tuberculosis. I do not know whether this trait is innate in the Jew or due to their code of sanitation.

Now with the idea of trying to get at this subject in a general way, there were introduced into several legislatures last fall, bills very similar,—practically the same in Michigan, Minnesota, Indiana, North Carolina and New York legislatures. In Minnesota, it did not get out of the committee. In Michigan, I think there was no objection except to the cost. In Indiana, it was reported out of committee favorably but failed to pass the first branch of the legislature. In North Carolina and New York, the bill passed. In both these states, it became a law. There is no question in my mind but what the bill will become a law in other states in the near future. The bill was along these lines: The State Board of Health shall divide the state into sanitary districts, appoint a health commissioner who shall give all his time to the work. The bill provides for the

appointment, qualifications, powers and duties, and compensation of county, district and state health commissioners.

Some method should be devised whereby we may look after the child in the home. In order to do this, we would need a large number of probation officers, and they should have the right to go into the home and find out whether the child is unfit for the home, or the home unfit for the child. A report of the conditions found should be made to the Judge of Probate. In New York, they have a commission to divide the state into not less than twenty districts. The Health Commissioner has charge of the whole work, and under him, there are various district commissioners. If there are better ways of getting at it, it seems to me that the time has come when all the people should get together and devise some method of reaching all forms of delinquency in the home. We see young men and young women openly going to the bad, and make no effort to stop them until some criminal complaint is made. Then it is, in the majority of cases, too late. Many of these cases should be under medical supervision. The probation officer should be sent to the home to inquire into the case.

Most prostitutes are feeble-minded. This is one of the causes of prostitution. Thirty-three per cent. of the prostitutes in Detroit are feeble-minded. They should be prohibited from attending the public schools. The public school system was devised for the morons and not for the normal child. I hope Dr. Berry will not take offense at this. Whether this is true or not, feeble-minded children ought to be eliminated from the public schools. Our schools are trying to force them out. I will say that occasionally one even gets into the University. They ought to be taken out and put at something they can do. It may be you think I am crazy, and possibly I am, but I came here with the purpose of presenting this and provoking discussion, in hopes that you will suggest some better method of reaching the homes of this class of children. Now all of the moral suasion we have used in the last fifteen years to do away with the social evil has not accomplished very much. I do not mean to go so far as to say that sex perversion is at the bottom of all of this. We will have to bear in mind that

sexual diseases were not the cause of the fall of ancient empires. At that time, there was no syphilis in Rome and none in Greece. Syphilis was imported to Europe from America, and was not the cause of the decay of these empires because there was no syphilis there at that time. There are other things quite as important. The most important thing I have to say is that we are not going to get rid of syphilis and gonorrhea until we educate our children in regard to them. We must get rid of the idea that we must not talk about these things. Boys and girls have not been instructed along this line, and I can bear testimony that ten or fifteen years ago, out of 4,000 male students in the University, there were from 600 to 800 cases of gonorrhea and from 200 to 300 cases of syphilis. It has been my habit to go to the doctors in the town and ask how many students they treated for this disease and for that. Now every male student that comes into the University, gets a card admitting him to a free course of lectures on venereal diseases. We also have lectures for the girls and I talk just as plainly to them as to the boys. It is too early yet to say what education along this line will do. There is no doubt but that conditions will be improved very much, but it will not do the whole thing. The time will come when every man, woman and child must be examined once every year for these diseases, and the physician will be compelled to make a record, and there will be a complete health record from the cradle to the grave. When one dies, a post-mortem examination should be made in order to have the record complete.

We have in Michigan today pretty good marriage laws. A German who recently looked up the marriage laws, says that Michigan has the best marriage laws of any place in the world. On the back of every marriage certificate, there is an oath that must be taken. That is that the individual has not been treated for insanity or mental defectiveness, and, if previously treated, has been cured of gonorrhea or syphilis. That is a pretty good law, but as more than one has said, "The oath of an insane man isn't worth anything." Also the Glasner bill which was before the Michigan legislature, and very unfortunately failed, providing for the examination of both man and woman before

marriage, was too good a law to fail. Laws will not be made until the people are ready to obey them. Episcopal clergymen will not perform a ceremony until the parties have both been examined by a physician. The Christian church has taken this stand. If this is not the right thing to do, let us do something else. Now I hope I have said enough to stir some of you up.

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## DISCUSSION

Dr. Bliss, Ft. Wayne, Indiana: I have in mind something that will be of a great deal of interest. A few years ago, Parke Davis & Company, of Chicago, offered to the school of Indiana, typhoid vaccine, provided we would use it, and make reports to them. Since that time, Parke Davis & Company have furnished sufficient vaccine to vaccinate all our patients. Up to that time, we had from ten to fifteen cases of typhoid a year. In the last two years, we have had just two cases of typhoid in the institution.

Supt. Wilson, Lapeer, Michigan: I would like to ask Dr. Vaughn if he thinks the subject of sex hygiene should be taught in the public schools, or in the home?

Dr. A. C. Rogers, Faribault, Minn.: Inasmuch as Dr. Vaughn will close the discussion, I would ask that Prof. Wilson's question be deferred until that time. I wish to say a few words about the marriage law which was before the Michigan legislature. I understand that it referred to the issuing of the license. I believe that education along this line will do more than anything else. When the young men and young women are educated along this line, we may then expect improved results. The selection of proper partners before people fall in love would give better results. We see the ill-effects after courtship has gone on, and then they are refused a license. Yet I would not be against the law. It seems to me that the particular thing is education, as Dr. Vaughn has already indicated.

Dr. Vaughn, will you now close the discussion?

Dr. Vaughn: I want to add to what I have already said, that communicable diseases dangerous to the public health,



must be reported now according to the law. Venereal diseases are not required to be reported by the name of the patient but by number. They have to go into quarantine for smallpox and for any other communicable disease dangerous to the public health, and why should they not be required to when infected with venereal disease? Why do you set off a red light district and separate the female prostitutes from the male prostitutes?

Another thing I wish to say. We should get rid of the sentimentality we have about these things. I say to my students: "To contract venereal disease is not a crime; it is a misfortune; one which it may require years to relieve yourself of, but to infect another with a venereal disease is a crime, and you may say a statutory crime." There are those who go so far as to say that a man or woman having contracted venereal disease is unfit for parenthood. I am a doctor, and have lived to see them rear strong, healthy children.

I think sex hygiene ought to be taught both at home and in the school. There are boys in the Ann Arbor public schools who are practicing improper sex relations; some are masturbating who are not seven years old. These children will have to be reached before they come to school. The work ought to be repeated and enlarged upon in the school. I think there are some things that a child will heed, or be more likely to heed, if it comes from some other person than the parent. A boy often thinks that a parent says things when he doesn't really mean them. If somebody else, for instance the teacher, talks to the child about these things, I think he would be more apt to heed them. There was a boy who got into the Ann Arbor school who was one of the worst sex offenders I had known. A probation officer was sent to his home, and upon questioning his mother about the child, she acknowledged it, and said, "Yes, I taught him." I hope this doesn't occur very often. This mother is a degenerate. Now are we going to permit children to live under these influences? One child will corrupt a whole school.

About the marriage laws, I agree with Dr. Rogers. It is largely a matter of education. There is another law on the statutes which is also a dead letter. The law is that it is a crime to infect another person with a venereal disease whether

it be in or outside of the marriage relation. I dare say that every physician in Michigan has had women come to him who are infected with this disease. One of two things is true: either she has been infected by her husband, or by somebody else. In either case, she can not say anything. In Europe, not in this country so far as I know, there are many cases where a man has been sent to jail, not because he raped a woman, but because he infected her with a venereal disease. Men and women should be compelled to be examined every six months in order that we may get rid of this disease.

## THE COTTAGE PLAN IN THE CARE OF THE FEEBLE-MINDED\*

BY GEORGE S. BLISS, M. D., *Fort Wayne, Indiana.*

It may seem presumptuous in me to undertake to tell such an audience as I have before me anything about building an institution, or to attempt to indicate the types of buildings or size of unit best adapted to caring for mental defectives. My excuse for trying to do so is the opportunity for comparison that has been afforded by a close acquaintance with the two large institutions for defectives, at Waverley and Fort Wayne, and the fact that some experience was afforded by initiating the institution "Way down East," at Pownall in the "State of Maine," as they always say down there.

If this brief paper shall promote discussion, as I hope it may, even though every one here may differ from the opinions I shall venture to express, I feel that new ideas may come to light or old ones be strengthened, and perhaps some good result.

Unfortunately or fortunately, the opportunity is seldom given to any man to work out the best plan for building an institution; first, because very few men have an opportunity to build an institution from the ground up, and second, because any man must change his ideas to some extent if he is progressive at all. The old type of institution building is well known to all of you, namely a large central building, generally used for administrative purposes, and perhaps a home for the official family and employes. Joined to this, usually by corridors, are large wings, symmetrical or otherwise, for the accommodation of the inmates. Most of our larger state institutions for defectives and insane were started by buildings of this type. A great many have today changed the plan of adding wing after wing to this central building, and now add by the plan known as the "cottage" or "detached building" plan. This

\*Read at the Meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

method of development is today so popular that I do not believe there are many men here who, if called upon to build an institution from the bottom up, would adopt any other plan than some modification of the cottage system. The term "cottage" has been applied to buildings of all sizes; from a small wooden structure that will accommodate fifteen, up to complicated fireproof buildings that will provide for two hundred inmates and the employes necessary to care for them.

If you were going to build a new institution, what size building would you adopt as your standard, and why? What type of construction would you use, and why? I regard the two hundred inmate building as too large a unit for several reasons. Very few institutions are so large as to furnish two hundred defectives, of one sex, and of a grade wherein the cases are so closely alike as to make a uniform group. Such a group furnishes, to my mind, little if any advantage over the old central type of building. The difficulty of finding a capable and satisfactory supervisor, male or female, for two hundred defectives, is a rather formidable one. Even the best of those we can obtain can hardly know as intimately as I believe they should so large a group of children, their likes and dislikes, needs and shortcomings. I thoroughly believe in a smaller unit, but I think we may go too far along this line and reach a point where our unit becomes too small to be practical for the mental defective.

The defective can best be handled in a sufficiently large group to make worth while an attendant for each working or living group. With too small a unit, supervision without which no defective can accomplish much, becomes very expensive. I believe a building of fifty to seventy inmates to be the most practical unit we can build. The more nearly we grade our children into uniform groups, the better we can care for, teach, supervise and work for them. A supervisor competent to know intimately fifty to seventy children can be found more easily than for two or even one hundred. Such a building divides very nicely into two good wards of twenty-five to thirty-five children. One attendant can care for such a ward if the children are not too low grade. This building is easy to administrate, convenient

as to quantity of supplies, and yet large enough if in a detached farm group to make quite a complete organization easily covered by a matron, cook and two or three attendants. Yet this unit is not so large but what a good woman, even though not exceptionally gifted as an executive, can know intimately every child under her care, and can be a real mother to him. If we get too small a building, say one of fifteen to twenty-five inmates, we increase a good deal the per capita cost of building and expense of running. This size for a building takes about as much overhead supervision as the fifty to seventy unit. It means about as much labor in requisitions, issuing, receiving and checking supplies, as the larger unit, and if applied to an institution of a thousand or more inmates, it means forty to sixty buildings to supervise, paint, and keep in repair.. Theoretically, the smallest unit, by approaching more closely to the home life, is ideal. Practically, I believe it has serious drawbacks if we try to go far below fifty. Relief from duty to the attendants becomes difficult in proportion as we lessen the number in a building, and with a very small unit, a shortage of attendants could easily render impossible, not only proper relief, but even adequate care and supervision of the inmates.

As to construction, I believe that even for farm groups, the materials should be fireproof, and as permanent as possible. Unfortunately, legislators are likely to consider the cheapest type of construction with more favor, and it is often possible to get a cheaply constructed building because it is cheap, where a fireproof, permanent building would be out of the question. Because of this, we are often led to ask for a cheap building that we can get, even when we know a more permanent and safe construction to be preferable. The less permanent construction affords an opportunity for renewal, and so enables us to keep up with the improvements and new ideas that experience, time and the development of ideas have shown to be desirable. The tendency of the defective to mischief, setting fires and destruction of property generally, is a strong argument in favor of durable, fireproof, permanent buildings.

This concludes the paper and I hope from the experience and ideas of those present, to obtain more light on this subject.

## THE FEEBLE-MINDED IN ONE MICHIGAN COUNTY\*

BY ADELE E. McKINNIE, *Lapeer, Michigan.*

The aim of field work in eugenics is two-fold: First, that we may know something of the way in which human traits are inherited; and second, that we may make some estimate of the number and location of persons who are not desirable as parents of the next generation. The material gathered is useful for both ends and should be available. But while it is necessary for only one group of people to be doing the scientific end, it would be immensely important for every state to have a Eugenic survey. This of course would comprise some sort of an estimate of the defective strains which are producing our anti-social person, but more important still, a registration of all defective children. It is possible that by the time these children become significant to the race as parents, we shall know more of the methods of inheritance and shall have agreed somewhat upon how they best be applied.

It has therefore been the aim of the eighteen months' field work in Michigan to make some estimate of the problem in the state. Forty charts have been made, fourteen of them of patients committed from other counties than Lapeer county. It was too superficial and limited a number even to guess whether there is to be found a Kallikak or Juke family in the state. At least we are sure there is not one in Lapeer county. Lapeer county has offered a very fair ground for such an investigation. It is one of the thirty counties in Michigan which existed in 1837 and had a population at that time of 2,800. This population gradually increased until in 1880 it was 30,000 and then it decreased somewhat, so that according to the 1910 census, the Lapeer county population is 26,033. The average population of a Michigan county is 31,000, thus showing Lapeer to be only slightly below the average. So that in point of age, it is among the oldest and in point of size, typical of the average

\*Read at the Meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913.

county which does not contain a big city. It is a comparatively rich county and numbers among its population several generations of excellent stock.

What has been its contribution to the population for the Home for Feeble-Minded as compared with other counties? There are only five counties from which more patients have been committed, which of course makes a large per cent. from Lapeer. This is to be expected but need not mean that there are necessarily more feeble-minded in proportion to the population, only that more people are familiar with this means of disposing of their defective children and relatives. So, then, there have been fifty-five patients in all committed to the Home from Lapeer county, although thirty-six only have been studied, eighteen being dead, and one whose relatives were not available. And of the thirty-six, thirty-one are feeble-minded and five epileptic. (May I say for those who are not familiar with the methods of field work that as many relatives, neighbors and doctors as it is possible to see are interviewed in order that all available information regarding the family may be obtained. It is possible to trace the family history to varying degrees, as for instance in the case of one chart, only fifteen members were found and two hundred and sixty-eight members have been charted in each of the two charts studied. It is not possible to get descriptions sufficient to classify but a part of these). I know it is said there are three kinds of lies, black, white and statistics, but that seems the best way to express results of the work which has been done. These thirty-one patients are from twenty-one families. Only one family has contributed as many as three patients, eight have two in the Home, and the rest have one. There are in all 2,144 individuals charted, 1,275 of those are described, and of that number a total of five hundred and sixty-eight, or 44.5 per cent. are normal; 489, or 38 per cent. defective. The defective group is divided into

187 feeble-minded, or 14.6 per cent.

19 epileptic.

52 insane or neurotic (34 of which were in one chart).

57 sex offenders.

11 criminalistic.

43 alcoholic.

The normal are in the majority but this does not detract from the importance of the fact that these families are to a certain extent supplying, in addition to the feeble-minded, the alcoholics, prostitutes, criminals and often the insane. They are also filling our institutions, for there is a total of 82 from these charts who either have been or are in a Michigan institution. It was found after the charts were completed that seventeen of these patients were related by marriage. The obvious conclusion from this fact is that feeble-minded strains are apt to inter-marry. However, in this case the connections have often been through normal people which fact rather detracts from drawing this conclusion. In all probability most of the families in a small community would be related could the family history be traced back far enough.

The family which has proved the most expensive to the State and County, both financially and socially, is No. 1241. In it there are 61 normal individuals, 62 defective, of which 41 are feeble-minded. But the most compelling fact in relation to this chart is that while there have been two patients in the Home, there are 42 feeble-minded living and at large in the State. However, this proportion is very much too large as applied to the other charts, for the average number of feeble-minded at large for each patient is three. This family, through the number of its members who have been in the State and County institutions, has cost society over \$15,000. This of course is exclusive of the many indirect sources of expense it has been.

From the point of view of the heredity of the patients as evidenced in studying the status of their parents it is interesting to note that

- 5 charts show both parents feeble-minded.
- 6 charts show one parent feeble-minded—other normal.
- 7 charts show one parent ins. or ne.—other normal.
- 1 chart shows both parents ins. or ne.
- 1 chart shows both parents tubercular.
- 1 chart shows both parents normal.
- 1 chart shows one parent normal—other tubercular.



1 chart shows one parent normal—other alcoholic.

Besides the information in regard to the feeble-minded in the county connected with these charts, we have attempted to get as nearly a complete list of feeble-minded in each community as possible from doctors, old residents, teachers, etc. A number of the names given in this way have not been investigated, and these have been eliminated. So this list as we give it, is without doubt, under-estimated as we have only those which have been authenticated. A total made of this list and the feeble-minded in the charts studied, makes 116 feeble-minded persons in the county. Of this number, 22 are under fifteen or of school age, and 94 are over fifteen years of age. The number of school children is undoubtedly below the actual number, as the School Commissioner gives 25 as a rough estimate of the obviously defective children in the district schools.

Computing from these figures, the ratio of feeble-minded persons to the population in Lapeer county, we have one to every 224. If in making this estimate, we include the feeble-minded who are in the Home from Lapeer county, the proportion is one feeble-minded person to 171 of the population.

In so far as Lapeer county may be considered a typical Michigan county for such an investigation, there seems no reason why this per cent. should not be applicable to other sections of the State with like conditions. In summarizing them, the significant fact seems to be this: There are 116 feeble-minded persons in the County, the name and address of whom are on file. And of this number, 22 are of school age. They are the parents of tomorrow and therefore should constitute our defective problem of today.

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## DISCUSSION

Dr. H. H. Goddard, Vineland, N. J.: Miss McKinnie's paper is most interesting and exceedingly valuable. A survey ought to be made in at least one county in every state, preferably in more than one. We are unfortunately too conservative. We, at least at Vineland, find cases who are defective, which we have previously passed by, unwilling to mark as feeble-minded.

When we take one in two hundred, and then realize that even that must be reduced a little, we find a definite problem pretty hard to get away from.

Referring to Miss McKinnie's charts, the lower one demonstrates something exceedingly interesting; that is, that these people do marry to a large extent in their own strata of individuality. In fact, the whole history would show what is brought out there; that in the main they do keep to their own level, and thus come in the same group. The fact is very remarkable that Miss McKinnie was able to get seventeen in the same marriage.

## FEEBLE INHIBITIONEDNESS\*

CHAS. B. DAVENPORT, Ph. D., *Cold Spring Harbor, New York.*

The Binet test serves to reveal the capacities of a person for numerical or ordinal succession for acquisition and retention of the names of a series like those of months, and days of the week; for orientation of oneself by such a series; for sentence building; for logical arrangement of words in a sentence; for definitions and relations of things; for acquisition of and ability to recall words; for the form sense; for weight, touch, color discrimination, for motor coordination and others. To a limited extent, as in the tenth year, under the head of questions of comprehension certain moral considerations are involved in the questions; but these obviously test the capacity for appreciating in an intellectual way a moral situation.

Now, as Dr. Fernald pointed out in the meeting of the Association last year, the Binet test fails to detect one class of "feeble-minded," namely the moral imbecile. For there are those, and they are among the most difficult of people to deal with, whose intellectual capacities are well developed but whose behavior is very bad. They may know intellectually that it is wrong to steal, but they can not resist taking things; they may read excellent essays on regard for the rights of others and yet frightfully maltreat and abuse others; they go into fits of temper without real provocation; they know about truth, but habitually lie; they have been taught the desirability of chastity but are habitually unchaste unless prevented. The cases I have in mind, in a word, are less feeble in mind than feeble in control of their reactions. They have long been recognized and are called moral imbeciles.

The normal infant responds to a given stimulus with much of the simplicity and directness of a fish or frog. If he sees something bright or attractive he takes it, without regard to whom it belongs; he will even fight for it; and will go into emotional ex-

\*Read at the Meeting of the American Association for the Study of the Feeble-Minded, Lapeer, Michigan, June, 1913

plosion if prevented. But, by careful training he learns that while certain reactions are permissible others are to be inhibited; and, fortunately, the normal white child finds himself equipped with the system of inhibitors which may be developed and become effective agents in determining moral or altruistic behavior.

The moral imbecile, on the other hand, seems to lack these inhibitions; they have never developed with the development of his mind; he remains childlike in respect to his control of the emotions. Our first impulse is to say, he lacks training; he is a spoiled child; but the experience of those in charge of institutions for wayward boys and girls indicates that the trouble is much deeper; they lack the capacity for inhibitions in one or all directions.

While the contrast between intelligence and control of reactions may be recognized, the question may well arise, is it significant? Is the absence of control of reactions anything else than a part of that general failure of the mind that is characteristic of the feeble-minded? Or, in others words, is it not only a particular case of the general phenomena of specificity in feeble-mindedness, or absence of mental capacity confined to a limited part of the mental field? A careful study of the subject, particularly from the standpoint of eugenics and after consideration of family histories, forces us to answer this question negatively; and to conclude that between failure of intellectual development and failure to control reactions there is a fundamental difference in kind. For, whereas, failure of intellectual development appears from genetic studies to be due to the absence of something—to the lack in the fertilized egg of a determiner for complete mental development—lack of control of the emotions is due to a positive factor; to the presence in the fertilized egg of one or more determiners that prevent inhibitions.

The evidence for this conclusion is based on extensive genetic studies, particularly on wayward girls. In opposition to all my prepossessions I soon discovered that at least two kinds of behavior are due to a positive factor—are dominant in heredity. These are a tendency to "fits of temper" and "erotomania" or uncontrollable sex impulse. The contrast in heredity is clearly

shown by this simple criterion. Hereditary feeble-mindedness often appears in the children of two normal parents; but a child with typical "fits of temper" or "erotomania" has at least one parent who is similarly afflicted; there is no skipping of a generation.

It follows that, whereas one may acquiesce in the marriage of a moron of good disposition to an untainted consort with the expectation that all children will develop mentally and react in normal fashion, this is not so with the emotionally uncontrolled. If the person who is subject to violent fits of temper or who has uncontrollable sex desires has children, half of them at least will be similarly affected; the trail of these unsocial impulses will stop only with the sterility of the unfortunates.

Finally, a word may be said as to the probable nature of the positive factors that determine violent temper and uncontrollable sex impulse. Two hypotheses are tenable. The temper and lust may be uncontrollable because they are exceptionally strong; or they may be uncontrollable because the working of the inhibitors is interfered with.

Between these two hypotheses it is difficult to choose. The first seems simpler but the fact that usually several emotions are simultaneously uncontrolled seems to me to favor the view of a general interference with inhibitions. Whatever the fundamental basis of this group of behavior, including waywardness, violent temper, eroticism, is seems to me practically important to differentiate it from feeble-mindedness. We should, I think, recognize the fact of feeble inhibition, the class of the feeble-inhibited; and the problem of feeble-inhibitionedness.

SOME RESULTS OF EXAMINING A THOUSAND PUBLIC SCHOOL CHILDREN WITH A REVISION OF THE BINET-SIMON TESTS OF INTELLIGENCE  
BY UNTRAINED EXAMINERS. FIRST  
ARTICLE.

BY F. KUHLMANN, *Faribault, Minnesota.*

In the spring of 1913 the public school children from the first to the seventh grade, inclusive, of Faribault, Minnesota, were examined with my revision of the Binet-Simon tests\* by twenty of the teachers. The immediate object of these examinations was not to secure further norms for the tests, but to furnish the school authorities and teachers with a more accurate knowledge about the school children. Twenty teachers were chosen and given a very brief preliminary training in the use of the tests. This training consisted of my first demonstrating the use of the tests to them by examining a number of feeble-minded children at the Minnesota School for Feeble-Minded. After this the teachers were divided into groups of three, one in each group as examiner and the other two as observers. In this way each teacher examined a small number of feeble-minded children for practice. The difficulties that the examiner met and criticisms were discussed in each case. Each teacher spent fifteen to twenty hours in this way. After this amount of practice, supplemented by informal discussions, they began the examination of the public school children. The examining was done mostly in the class-rooms during recesses and after school hours, when the rooms and halls were cleared of pupils. The results have three different lines of interest. First, the ability of the examiner without any special training to use the tests with a reasonable degree of accuracy. In connection with this question, it should be stated that the revised scale used contained a

\*See "A. Revision of the Binet-Simon System for Measuring the Intelligence of Children," *Journal of Psycho-Asthenics*, Monograph Supplements, Sept., 1912.

much more detailed statement on how to give each test and how to interpret the responses than the authors of the tests supply. Second, the scientific value of the results in showing further possible improvements in the scale, and in showing the mental development of a representative group of public school children. Third, the usefulness of such results to the school authorities and teachers. In reporting the results on the first two in the present article, advantage will also be taken of the occasion to bring up to date and consider rather in full the more fundamental problems of a scientific scale of tests which recent studies have brought to the foreground of discussion.

#### A. The Untrained Examiner.

Psychologists seem to be almost universally agreed that a psychological training and some practice in the use of the Binet-Simon tests are required of an examiner if he is to obtain accurate results. There is a similar consensus of opinion that any intelligent person without special training or practice will find the tests useful in obtaining a better understanding of a child's mental development than he can get in any other way, or can get without very prolonged and close observation. But it is not at all clear yet just what kind of training and how much training and practice must be demanded. Is it a familiarity with the general principles of psychology, or with the mental development of the child, or a drill in laboratory technique that is needed? Will the practice derived from examining a dozen children suffice, or must it be twenty-five, fifty or several hundred? We have also as yet no definite idea as to how large errors we may expect from the untrained examiner. The present writer has had occasion to observe the difficulties that about fifty untrained examiners met in giving the tests, each examiner testing from several to twenty-five children. A study of the scorings by the twenty Faribault teachers and a few others also brings to light some facts about this question. An analysis of these observations will give some idea as to just what kind of training is required to make a successful examiner.

The initial main difficulty is lack of familiarity with the directions for giving each individual test, which remains until a considerable number of children have been examined. The de-

tails of these directions in the whole system of tests are too many to be mastered in any other way than through thorough practice in giving the tests. To eliminate this factor entirely the average person probably needs to examine about fifty children. In the absence of this familiarity the unpracticed examiner has to resort to one of two methods. He either guesses at the directions and gives the tests usually in considerably modified ways, or he stops to read the directions first before giving each test. Either procedure is detrimental to accurate results. The former is entirely unpermissible because a very slight change in the manner of giving a test may sometimes radically alter it. The latter is fatal to the proper attitude and interest of the child under examination. It is very essential to arouse and maintain the child's best efforts. For when this is not obtained or is lost, we have no longer any means of knowing how much the child's failure is due to lack of effort and how much is due to lack of mental development. Hesitations on the part of the examiner, or making the child wait between tests, very easily causes him to lose interest. For the sake of the examiner's practice, however, the latter is the course to follow. For guessing at the directions and giving the tests wrongly makes it more difficult to learn to give them correctly.

A second difficulty which appears largely at the beginning is an inability to interpret the responses of the children correctly. It is not always easy to judge whether a response is to be accepted as satisfactory or regarded as a failure to pass the test. The variety of responses for some tests is very large, and it is impossible to classify them all in such a way that the uninitiated can use the classification without error. In my revision of the tests an effort has been made to give directions for interpreting responses as well as for giving the tests, wherever such seemed at all called for. My experience since then, however, has shown that more are still needed to avoid difficulties of interpreting responses in some cases, for untrained examiners. Fortunately this difficulty does not affect the majority of the tests. In most cases the response is at once obviously satisfactory or obviously a failure. Where the difficulty is present it disappears in a measure with practice. Familiarity with the dif-



ferent kinds of responses obtained facilitates ready classification and improves the ability to judge them correctly. However, judging them correctly sometimes implies a knowledge of some psychological principle involved, or of some trait in the mental development of children. Where this knowledge is absent, incorrect interpreting of responses will remain.

In this connection a third and more serious difficulty arises. Responses are sometimes of such a nature as to call for a variation in the procedure in giving a test. Each test aims at a definite object. It is to ascertain whether the child is capable of the performance involved. The directions for giving a test are devised to best bring out the child's ability in this performance. But they fit only the average child under average conditions. A failure to respond at all, or a response that can not be interpreted as either a "pass" or a "failure" calls for a variation in the procedure in giving the test. In the absence of a complete classification of these responses, directions on how to vary the regular procedure in giving a test can not be made complete. My revision gives some such supplementary directions, and lays down the general rule to "follow them literally until from obvious reasons arising from unusual circumstances the object can not be obtained with these directions." The untrained examiner meets grave difficulties in knowing how to vary the procedure under such circumstances in ways that are at all legitimate. Very frequently his variations so alter the test that the response of the child is no longer of any value or significance. Practice in the use of the tests does not decrease this difficulty very much. To do this well involves a judgment and skill that comes only from thorough psychological training and familiarity with laboratory methods.

A further matter concerns the untrained examiner's inability to adjust himself in general to the requirements of the procedure. It is not enough merely to ask the child the questions of the tests and to give him the directions to do the things in the tests as outlined. The manner in which this is done is often more important than the exact words that are used. The examiner must assume the general attitude most natural to the child he is examining. He must get down to the child's mental level in

each case. An attitude proper for a four or five-year-old child, for example, would be fatal to securing the best efforts from an eight or nine-year-old child. The procedure must be carried out in the general spirit of a game in order to arouse the young child's interest, but must have enough seriousness in it for the older one not to cause him to regard it as mere play and of no consequence. To arouse and maintain the child's interest from test to test it is often necessary to interpolate other questions and activities not directly involved in the tests. In certain extreme cases, such as are found in a certain type of feeble-minded children whose attention is easily attracted and distracted by everything about them, the actual tests to be given often have to be worked in incidentally among other things that are used to lead up to the real tests to which responses are desired. Long continued practice in examining tends to develop a skill in doing this and in making the general adjustments here in question. It is, however, largely not a matter of practice or of psychological training. Some people have a natural ability to handle children and to get the best responses of which the children are capable. Others fail to do so, and seem not to improve much in this respect with practice in giving tests. We might say that they are temperamentally unfit for examiners, similar to the case of the good student while in college who always remains a poor teacher in spite of knowledge and training. Adequate psychological training and practice in the use of the tests does not, therefore, always assure success as an examiner. Among the small number who have come under my observation there were at least two who never will make successful examiners, however long they continue their practice and training, while there are several who were remarkably successful from the beginning in securing the child's interest and best efforts in the examination.

These general facts come to light in merely watching untrained examiners give the tests. A study of the filled-out blanks on which the Faribault teachers recorded the responses of the children by "plus" and "minus" signs gives some additional very important results. They reveal four very general faults in the work. They are: (1) irregularity of the results, when a child fails in two or more tests in a lower age-group and passes all in

higher age-groups; (2) errors in counting up the mental age from the individual plus and minus scorings; (3) not carrying the tests far enough, but stopping with an age-group in which there were only two or three failures out of the five tests; (4) beginning with too high an age-group and not going back to the lower ones, so that the record showed failure in one or two tests in the lowest age-group tried. In the records of sixteen of the teachers these faults appeared very frequently, several averaging one fault to about every two children examined. The records of a few were entirely free from all of them, each having examined about forty children. With the exception of the first one, one may trace the causes of these faults with a fair degree of certainty. Frequent very irregular results in the records of an examiner in examining normal children simply shows that something has been done wrongly, but we can not trace it to its source. The probability is that the examiner failed to get the best responses from the child he was capable of, through approaching him in a wrong manner. In this case it is an error due to the examiner's failure to assume the proper attitude towards the child. The child's failure to pass the tests that he should pass may, on the other hand, be due to the examiner not following the directions for giving them and making them more difficult, or to his misinterpreting the child's responses. But errors from these two sources are not so apt to occur in age-groups quite below the child's mental age. They occur most frequently in tests that are already relatively difficult for him. The other three faults one is at first sight inclined to attribute to mere carelessness. They are all due to failure to follow simple rules clearly stated in every case, and in themselves easy to follow. But further analysis makes the fault a less personal one. The third and fourth are doubtless in part due to pressure brought to bear on the examiners to hurry, through lack of spare time and leisure in which to do the work, and possibly to some rivalry between the examiners to make rapid progress. The whole, however, reduces itself to a failure to understand the magnitude and seriousness of the errors made, and to appreciate the necessity of proceeding carefully according to rule

at every point. It is human nature to attempt short-cuts to attain desired ends, in place of going the round-about way outlined by rules and conditions to be learned and followed. The same tendency was repeatedly observed in watching different examiners testing children. In the absence of familiarity with the directions some do not hesitate to guess at them and give the tests in altered forms, while others refused to proceed until they understood clearly just how to give them. The difficulty teachers of psychology always experience in making undergraduate students follow the methods outlined in laboratory experiments reflects exactly the same thing. The only remedy for it is extended laboratory training. This alone can teach to the individual the need of details in rules and methods, and that it is unpermissible not to follow them if accurate results are to be obtained. Without such a foundation, practice merely in the use of mental tests will not do much to supply the deficiency here in question.

After this analysis of observations, we are in position to give a more or less definite answer to the question as to what kind of training and how much is necessary to make a good examiner. The question divides itself into several different ones, for several quite different things are required of the examiner. The successful examiner must have the following qualifications: (1) Thorough familiarity with all the rules and directions for giving the tests. (2) Familiarity with the variety of responses obtained from children and ability to interpret them correctly in all cases. (3) Ability to alter the procedure in giving a test in legitimate ways when unusual circumstances arise that demand it. (4) Ability to assume an attitude towards the child under examination that will arouse the child's interest and call forth his best efforts. (5) A proper appreciation of the absolute necessity of adhering strictly to all the rules of testing. We may now ask what kind and how much training each of these qualifications calls for and summarize the answers already given above. The first requires practice in the actual use of the tests. I am convinced that the average person will have to examine at least fifty children in order to become so familiar with all the details as to enable him to give all the tests accu-

rately and without hesitations in the procedure. The second requires mainly practice in the use of the tests, but in a few cases calls for a general knowledge of the principles of psychology and of mental development of children. The third calls for a knowledge of psychology and laboratory training. No one could be regarded as really qualified to make alterations in the ways of giving mental tests who has not had several years of psychological work, including a minimum of a year of thorough laboratory training. The fourth calls for qualities that largely can not be acquired by training. Extended practice in the use of the tests and in handling children in general will increase an examiner's abilities along this line. The fifth, if not present already, can be acquired only through extended laboratory training covering a minimum of a year's time.

It remains to point out that these qualifications are of very unequal importance, largely because some are constantly called for, while others are but rarely called for. The first, fourth and fifth are constantly called for, and are therefore very essential. The fourth everyone possesses in a certain measure, and the fifth some examiners have naturally and do not need to acquire by training. My experience, however, points to the conclusion that the majority of untrained examiners will fail because of a lack of this qualification. The second is not needed in the great majority of the tests, for the majority of the tests are of such a nature that the response of the child is at once obviously a "pass" or a "failure." Instances in which a special psychological knowledge is necessary are rare. The third is least often demanded. If the tests are correctly conducted in every other respect the occasion for altering the way of giving a test occurs relatively infrequently. Thus it is seen, in a word, that the person without much knowledge of psychology or laboratory training **may** be able to always get accurate results with the great majority of the individual tests, and **usually** with all the tests; he may have all the other qualifications. But in the majority of cases they fail because of a lack of the fifth, which mere practice in the use of tests does not supply.

In enumerating and analyzing the several sources of error the untrained examiner is subject to, one is apt to over-estimate

their influence on the general result, the mental age of the child as determined by such an examiner. We may, therefore, consider next the question as to the degree or range of error untrained examiners are liable to make in the mental ages obtained. This is not easy to determine with complete accuracy. It may be found approximately by comparing the results with those of a well-trained examiner. The mental ages obtained by the two examiners in examining the same children should agree for every child to within a few points. Absolute agreement for any two examiners will always be the exception rather than the rule, for no examiner can always get all the conditions of an examination under absolutely perfect control. The most expert examiner will in the majority of cases not get exactly the same results in examining the same children a second time. The writer has had occasion to compare the results of about three hundred feeble-minded children examined by untrained examiners with his own results in examining the same children. These results might be given in statistical form except for the fact that two factors entered to destroy the value such a statistical comparison might otherwise have. These are, first, that in most of these three hundred cases I used the 1908 series of tests, while the other examiners used my revision of the tests in nearly all cases. Secondly, the two examinations of a child were rarely made in more or less immediate succession. In many instances there was an interval of as much as two years. In some of these latter cases the child had undoubtedly made some mental progress during the interval between the two examinations. On the other hand, it should be stated that none of the examiners were entirely unfamiliar with the tests and untrained. All had at least read them through several times and had watched the testing of several children. Under these circumstances the comparison of my own results with those of the other examiners gave, in a word, the following: The maximum difference in the mental ages obtained for any child in the two examinations was two and two-fifths years. A difference of two years occurred several times, and a difference of over one year quite a number of times. In the great majority of cases the difference was less than a year. Instances in which the differ-

ence was two years or more were traced up further in order to discover the cause. These were found to be (1) marked improvement in the intelligence of the child since the first examination, as shown by the improvement in his school work and a subsequent, third, examination; (2) failure of one examiner to get the best responses from the child he was capable of, as proven by a third testing; (3) failure of the examiner to carry the tests far enough into the higher age-groups. These facts lead to the general conclusion that the untrained examiner may, because of his unfamiliarity with the tests and lack of psychological training, etc., make an error in the mental age of over two years, but that in the majority of cases his result will be accurate to within less than a year. They show also that the larger errors he makes are due mainly to his failure to follow the simple rules of testing which in themselves are easily enough followed and to his inability to so adjust himself to the general procedure in the attitude he takes towards the child as to call forth the child's best efforts in responding. The remedy for these faults have already been discussed.

#### **B. Comparison of the Average Age With the Average Mental Age.**

In considering the scientific aspects of the results obtained by the Faribault teachers in examining the Faribault public school children we must always bear in mind that in all questions concerning the accuracy of the revised tests or the grades of intelligence of the children three factors enter. These are errors in the mental ages due to inaccuracies in the tests, errors due to the examiner, and variations in the intelligence of the children from an average normal standard. In any given case in which the age and mental age of a child do not agree we can not say at once to which of these three factors the disagreement is due, or how the three factors combine to produce the discrepancy. However, we have a fair idea of the limits of the influence of these three factors, and in different results each has in turn been wholly or in part eliminated. It is hoped that the analysis of the results given below and the comparison with other results obtained under other conditions will make some

contribution to the scientific phases of mental tests and mental testing.

The question as to the accuracy of the revised tests falls at once into two separate ones. First, the accuracy of the tests on the whole, the measure of agreement between each chronological age and the corresponding average mental age. For instance, is the average mental age of a group of average normal six-year-old children always just six years, as determined by the tests, and is the same true for each of the other chronological ages? This agreement might be close for one age and poor for another. The degree of agreement for each age is the first question to decide. It will show whether the scale of tests has any general tendency to measure too low or too high at any point. This agreement, however, might be perfect in each case when averages only are considered and yet the tests might not be very accurate. For individual children the tests might sometimes measure too high, and sometimes too low, giving more or less frequent errors in the mental age, which errors would cancel each other in the average. The second question concerning the accuracy of the tests is, therefore, that of the frequency and range of error in the case of individual children. This distinction is of the first importance, both from the practical standpoint of usefulness of the results and from the standpoint of perfecting the scale of tests. Where the scale measures too high or too low on the average the amount could be easily subtracted or added to the results in order to obtain the correct average mental ages. But in the case of the result for the individual child no correction could be made because it is never known when an error occurs. As regards perfecting the scale of tests, faults of the first kind could be remedied by shifting tests from one age-group into another, but faults of the second kind might be difficult to overcome.

We will first compare the average chronological ages with the corresponding average mental ages. That is, we will compare the average age of the group of children who are all nearly six years old with their average mental age, and do the same for the other ages up to the age of fifteen, inclusive. In this comparison the influence of errors in the mental ages due to the ex-



aminer should be largely eliminated. It might be supposed to be entirely eliminated on the basis of the assumption that these errors made in the mental ages are too large sometimes, and sometimes too small in such a way as to cancel each other. But we can not make this assumption in entire safety, since there may have been a general tendency of one or several examiners to make errors in one direction rather than in another. The influence of variations in the intelligence of the children was present, since the children examined were not selected with reference to their normality. In the present comparison, however, this influence is quite negligible. If we assume that as high as one per cent., even, of the children were feeble-minded it will be seen in making the computation that their presence would not materially affect the averages that are here considered. We should have, therefore, a fair indication in these results as to whether the revised scale has a tendency to measure too high or too low at any given point.

The exact chronological ages were not obtained for quite a number of the children examined. After eliminating these there were left 730 for which alone the statistical results are considered. The children were first grouped according to their ages, putting all who were five years and six months to six years and five months into the six-year group, the same being done for the other year-groups. The average ages of these groups should then come out very closely to exactly six years, seven years, etc. In recording the mental ages of the children fractions of a year were counted, and since the number of tests in each age-group in the revised scale is five, these fractions are fifths of a year. These fractions were kept in computing averages. Table I gives the comparison of average age with average mental age for the ages of six to fifteen years.

TABLE I

|                |      |      |      |      |       |       |       |     |       |       |       |
|----------------|------|------|------|------|-------|-------|-------|-----|-------|-------|-------|
| Av. Age        | 6.16 | 7.03 | 8.02 | 9.08 | 10.01 | 11.02 | 12.02 | Av. | 13.04 | 13.96 | 14.92 |
| Av. Mental Age | 6.94 | 7.36 | 8.28 | 9.28 | 10.19 | 10.88 | 11.07 |     | 11.58 | 10.39 | 11.67 |
| Difference     | +.78 | +.33 | +.26 | +.20 | +.18  | -.14  | -.97  | .41 | -1.46 | -3.57 | -3.25 |
| No. Cases      | 38   | 83   | 96   | 91   | 84    | 88    | 75    |     | 69    | 68    | 38    |

This comparison shows that the revised scale is still too easy at its lower end, and too difficult at its upper end, a fact

that other observers have found to be true of the 1908 scale.\* It is especially easy for six-year-old children, who lack only a little over a test to measure a whole year too old mentally. This result may be partly accidental, because of the small number of cases figuring in this age-group. After the six-year-group the scale runs with quite satisfactory accuracy up to the twelfth year, where it more or less suddenly measures almost a year behind the chronological age. It will be noticed further that the mental age does not increase materially after the eleventh year. This might at first sight be taken to mean that development of intelligence begins to stop at this point. This interpretation, however, would be erroneous. The result is due to the fact that there is only one age-group of tests after the twelve-year group. Eleven year and older children have, therefore, less opportunity to pass extra tests beyond the age-group in which they pass all and thereby gain extra credits in mental age. The fault lies mainly in the method of counting up the mental ages, which is very admirable for the rest of the scale, but necessarily meets this difficulty at this point. That it lies only in a small measure in the too great difficulty of the individual tests in these upper age-groups is shown by the further fact that eleven and twelve-year-old children pass the eleven and twelve-year-old tests approximately as frequently as nine and ten-year-old children pass nine and ten-year-old tests. Figures on this will be given later in other connections. With the present rule for counting up the mental age, the only remedy lies in the addition of more tests at this upper end.

By comparing this showing of the revised scale with results obtained by others who used the 1908 scale, some idea may be gained as to whether the revision has made any improvement in the scale with reference to this point. In attempting to make this comparison, however, we meet the fact that no two authors have obtained results under exactly the same conditions, or have stated them in different forms. This makes accurate compari-

\*See especially Johnston K. L. An English version of M. Binet's tests for the measurement of intelligence. Training School Record, London, 1911. Terman, L. M., and Childs, H. G. A tentative revision of the Binet-Simon measuring scale of intelligence. Journ. Educat. Psychol., 1912. Bobertag, O. Ueber Intelligenzpruefungen (nach der Methode von Binet und Simon) Zeitschr. f. angew. Psychol., 1911.

sons impossible. On the other hand, it gives a means, though very rough, of determining the possible influence of these varying conditions on the statistical results that we wish to compare, and thus supplies a means of analysis. The varying conditions with which we have to deal are as follows: (1) The children tested. (a) They have been of different nationalities, requiring the tests to be adapted from the original French to the German and English languages and life. (b) They have been selected with varying degrees of thoroughness with reference to their normality. Those of Binet and Simon (\*), and Bobertag (†), were selected so as to include only children who were in the school grade in which they normally belonged. Those of the other authors to be considered here were taken as found in the public schools without further selection. (2) The examiner. In the case of Binet-Simon, and Bobertag, the children were examined by one or two well-trained and experienced psychologists. In Goddard's (‡), and in Terman and Childs' (§) results they were examined by several partly trained examiners. In the case of my own results they were examined by twenty practically untrained examiners. (3) The accuracy of the ages given by the children. Goddard dropped fractions of a year entirely. Binet-Simon's cases were exactly of the ages given. Bobertag's were all within two months of the ages given. Terman and Childs apparently took fractions of a year into account, but do not state how small fractions. In my results given in Table I fractions of a half month were taken into account. (4) Accuracy of the mental ages given of the children. Binet-Simon, Goddard and Bobertag dropped fractions of a year in the mental ages. Terman and Childs, by a special method of procedure, counted half years, but usually dropped extra tests passed if they were not more than one or two. In my results fractions of a year in the mental ages were counted by fifths, which in the revised scale is the value of the individual test. Under these conditions, it so happens that no direct comparison

\*Le developement de l'intelligence chez les enfants. *L'Annee Psychologique*, 1908.

†Reference quoted above.

‡Two thousand children measured by the Binet measuring scale of intelligence. *Ped. Sem.*, 1911.

§Reference quoted above.

is possible between any two authors, the conditions not having been all the same for any two. However, the comparison will show something, both with reference to the relative accuracy of the revised scale in comparison with the 1908 scale, and with reference to the influence of the different conditions entering. Goddard's results for 1,547 non-selected public school children examined with the 1908 scale by five partly trained examiners offers the most direct comparison with my results when re-grouped and when fractions of a year in both the ages and mental ages are dropped, as Goddard has done. In this the only varying condition is in the amount of training the examiner had, and the difference in the number of children examined in the two cases. If the number of cases were large enough to eliminate accidental variations it should make no significant difference, for the purpose of the present comparison, whether fractions of a year were dropped in both the age and mental age or whether they are taken into account in both. For, in the case of large numbers, the average age would be exactly or very nearly six and a half, seven and a half years, etc., in place of six, seven years, etc. Likewise, the average mental age would be four-tenths of a year too small. For, according to the rule of counting the mental age, five extra tests passed give an extra year to the mental age. Zero to four extra tests left over are not counted. The average number of extra tests passed and not counted would therefore be two, or two-fifths, equals four-tenths of a year. Thus, as compared with counting fractions of year in both age and mental age, dropping them in both would make the average mental age always one-tenth of a year too small. Figures to be computed from one of Goddard's tables might be corrected by adding five-tenths of a year to the average age and four-tenths to the average mental age. But little would be gained by such modification. In Table II are given my results re-grouped when all fractions in the ages and mental ages are dropped. Table III is derived from one of Goddard's tables and is to be compared with Table II.

TABLE II

| Age            | 6     | 7     | 8     | 9     | 10    | 11    | 12     | Av. |
|----------------|-------|-------|-------|-------|-------|-------|--------|-----|
| Av. Mental Age | 6.65  | 7.44  | 8.44  | 9.10  | 9.98  | 10.59 | 10.87  |     |
| Difference     | + .65 | + .44 | + .44 | + .10 | — .02 | — .41 | — 1.13 | .47 |
| No. Cases      | 68    | 91    | 88    | 92    | 92    | 76    | 69     |     |

TABLE III

| Age            | 6     | 7     | 8     | 9     | 10    | 11    | 12     | Av. |
|----------------|-------|-------|-------|-------|-------|-------|--------|-----|
| Av. Mental Age | 6.33  | 7.13  | 7.74  | 8.82  | 9.66  | 10.12 | 10.48  |     |
| Difference     | + .33 | + .13 | — .26 | — .18 | — .34 | — .88 | — 1.52 | .52 |
| No. Cases      | 160   | 197   | 209   | 201   | 222   | 166   | 144    |     |

The comparison in these two tables shows the revised scale only very slightly more accurate on the whole than the 1908 scale. The improvement is all for the ages of nine to twelve, inclusive. For the ages of six to eight the revised scale gives slightly poorer results. The general average variation of the mental ages from the age is .47 year for the revised scale and .52 year for the 1908. But these figures are somewhat too unfavorable to the revised scale. By dropping the fractions of a year in the ages and mental ages makes the revised scale show up more poorly than it does in Table I, where these fractions are kept. The error introduced in Table II is due to accidental variations resulting from small number of cases. This error should be reduced in Table III possibly in proportion as the number of cases is larger. The number of cases is approximately twice as large in Table III as in Table II. The varying factor of the examiner for the two scales also favors the 1908 scale. As was quoted above, twenty practically untrained examiners obtained the results for the revised scale, while five partly trained examiners obtained the results for the 1908. It is, therefore, fair to conclude that this comparison shows an appreciable improvement for the revised scale. A more definite idea of improvement in its general accuracy may be gained by carrying the comparison and analysis further.

We may next consider the results of Terman and Childs in examining 396 unselected public school children with the 1908 scale, the examinations being made by the authors, and two assistants who presumably had some training for the work.

These authors compare the median ages with the median mental ages. Table IV is taken from one of their tables.

TABLE IV

|                 |      |     |     |     |      |       |       |     |
|-----------------|------|-----|-----|-----|------|-------|-------|-----|
| Med. Age        | 6.37 | 7.5 | 8.5 | 9.5 | 10.5 | 11.46 | 12.33 | Av. |
| Med. Mental Age | 6.5  | 7.5 | 8.0 | 9.0 | 10.0 | 10.0  | 10.5  |     |
| Difference      | +.13 | 0   | -.5 | -.5 | -.5  | -1.46 | -1.83 | .70 |
| No. Cases       | 26   | 29  | 43  | 49  | 33   | 44    | 35    |     |

These figures show the same general tendency of the scale seen in the preceding table. The general average variation of the mental age from the age is somewhat larger than for Goddard's results, being .70 year as compared with .52 year. Probably the smaller number of cases in Table IV and the use of the median in place of the average is more responsible for the difference than the other factors. The other varying conditions for the results in Tables III and IV lie in the fact that Terman and Childs took fractions of a year into account in the ages and fractions to a half year in the mental ages. Thus, with reference to likeness of conditions as to examiners, Table IV should be compared with Table III. But with reference to likeness in counting fractions of a year or not, it should be compared with Table I.

Bobertag in one of his tables gives the results of his own examination with the 1908 scale of 180 selected school children all of whom were within two months of the chronological ages given. The children, all of whom were in their proper school grades, were first divided into three classes according to the quality of their school work. One hundred and eighty were then chosen from the middle grade in such a way that about an equal number belonged to each age, from seven to twelve, inclusive. The results for these 180 children are given in Table V, taken from one of his tables.

TABLE V

|                |      |      |      |      |       |       |     |
|----------------|------|------|------|------|-------|-------|-----|
| Age            | 7    | 8    | 9    | 10   | 11    | 12    | Av. |
| Av. Mental Age | 7.16 | 8.43 | 9.00 | 9.97 | 10.65 | 11.43 |     |
| Difference     | +.16 | +.43 | 0.0  | -.03 | -.35  | -.57  | .26 |
| No. Cases      | 32   | 28   | 30   | 30   | 32    | 28    |     |

These results show the closest agreement of ages and mental ages of any, including those for the revised scale in Table I.

It is closer for four out of the six ages, from seven to twelve, than in Table I, and has a general average variation of only .27 year, as compared with a general average variation of .33 year for these years in Table I. Bobertag did not count the fractions in the mental ages. When four-tenths of a year are added to his mental ages, a procedure that is, however, hardly permissible for his small number of cases, the agreement between ages and mental ages becomes somewhat less, giving a general average variation of .38 year in place of .26 year. When four-tenths are subtracted from the average mental ages in my results in Table I to make the figures more directly comparable with Bobertag's as given in Table V, the agreement becomes less for my results, giving a general average variation of .42 year in place of .33. The factors present that might produce this favorable result for the 1908 scale in Bobertag's results were (1) selection of the children with reference to their normality, and (2) examination of all by one and the same examiner, an experienced psychologist. These figures bring out the fact that the examiner or the more accurate selection of the children with reference to their normality than is obtained by taking merely public school children, or the two combined at least, are of greater importance in making the average ages and average mental ages equal than any of the other variable factors with which we have had to deal in comparing results of different authors.

We may bring the main figures of the five tables together now into one table for a more ready and final comparison. This is done in Table VI.

TABLE VI

| Age              | 6   | 7   | 8   | 9   | 10  | 11    | 12    | Av. |
|------------------|-----|-----|-----|-----|-----|-------|-------|-----|
| K.—Table I       | +78 | +33 | +26 | +20 | +18 | -14   | -97   | .41 |
| K.—Table II      | +65 | +44 | +44 | +10 | -02 | -41   | -1.13 | .47 |
| G.—Table III     | +33 | +13 | -26 | -18 | -34 | -88   | -1.52 | .52 |
| T. & C.—Table IV | +13 | +0  | -5  | -5  | -5  | -1.46 | -1.83 | .70 |
| B.—Table V       |     | +16 | +43 | .0  | -03 | -35   | -57   | .26 |

In this table the ages are given as just six, seven, eight, etc., years for all authors, the fractions in the case of all authors being omitted. The other figures give merely the differences between the average ages and average mental ages. It appears

from these combined results that the revision of the scale has made a marked improvement in its general accuracy, the larger improvements being in the upper ages, from ten to twelve, inclusive. For the ages of eight and nine the improvement is less, and for the ages of six and seven the revision seems to have made the scale easier where it was already too easy. The unfavorable showing for the revised scale in the sixth year can perhaps be largely accounted for. It is probably an accidental variation made more possible by the much smaller number of cases, only 38, for this age than I had for the other ages. Either these children, who were all in the first grade, were brighter than the average, or the particular examiner who examined the children of this grade had a general tendency to get the mental ages too high. This explanation becomes more plausible when it is noted that in the revision no new tests were introduced into any age-group before the eighth, either from other age-groups or from the outside as entirely new tests. The tests responsible for giving a mental age of six to seven were, therefore, not made easier in the revision by introducing new tests. Age-group six, however, was made some easier by dropping out one of the tests that was found too difficult for this age-group. In age-group seven, which enters in giving mental ages of six to seven, one test that was too difficult was pushed forward into age-group eight. It is not likely that this amount of revision is responsible alone for the present difference between the average age of six and the corresponding average mental age. Moreover, it is found on further examination that there were several children in this small group less than six years old who were advanced in their mental ages by two years or more, a quite exceptional result. We are left with the general conclusion for the whole scale that the revision has made larger improvements than the figures in these tables indicate directly, and that the presence of children in the group examined who varied considerably from the average normal, and the lack of training of the examiners are responsible for making the agreement between the average ages and the average mental ages poorer than it should be. How much of this is due to the varying factor of the normality of the children and how much to the examiners is



left undecided. Later analysis, however, will show that the latter has played a very large role.

### C. Frequency and Range of Error in the Mental Ages.

If the scale of tests were without exception always as accurate in the examination of each individual child as it is shown to be in the average results, there would be little left to be desired. If this were the case, indeed all that we would need to do to obtain absolute accuracy would be to add to or subtract from the mental age obtained for any child the amount the average results are seen to vary from absolute accuracy. But the matter of the frequency and range of error in the mental ages when we are considering individual children is an entirely different question. The data so far considered really gives us very little idea as to the accuracy of the tests in this respect. For some purposes the tests would still be of the greatest value if on the average they gave accurate results but frequently made large errors in individual cases. They would still serve to give us accurate information as to the general status of any large group of individuals. We could compare different schools, or compare juvenile delinquents as a class with normals, or immigrants as a class with normal American-born, etc., and know exactly the mental status of the group as a group in each case. We need not dwell on the value and significance of such data if we had it. But this can be obtained now with the Binet-Simon tests.

Since we want information about the individual so much oftener than we do about a group as a group, the importance of the present question increases in the same measure. Besides, it is the individual always with whom we are finally dealing, and if we know each individual we necessarily know the group to which he belongs. The question as to the frequency of error, and the question as to the range of error in the mental ages obtained by the tests are also not of the same significance and importance. If the range of error were small enough to have little or no importance in itself, its frequency would not alone affect the value of the tests much. For no matter in how many individuals it occurred, we could always feel certain that it was of no consequence in our dealings with the individual. If the

range of error were large, however, its relative infrequency would not entirely compensate for its large range. For in this case in our dealing with the individual on the basis of the test results we would occasionally do him great injustice without knowing when it occurred. The two questions will, however, be considered together, since the same data answer both equally well. In connection with our own results we must note at once that their value in answering the present question is directly affected by two of the several factors pointed out above as entering in causing discrepancies between the ages and mental ages. These are errors made by the examiners because they were untrained, and variations in the children from the average normal intelligence because they were non-selected children. We may again compare our results with those of others who used the 1908 scale. If this comparison shows no greater or a less frequency and range of error for the revised scale it will indicate an improvement in the revision over the old scale. If it shows a greater frequency and range of error no definite conclusion can be drawn.

I. Comparison of the Distribution of the Mental Ages with the Normal Distribution Curve. The method most employed to decide the frequency and range of error in the mental ages has been to examine a large number of school children and find the number that varied in their mental age from their age, and the range of this variation. It has been assumed that the curve of frequency of these variations in the different amounts must have the same character as the normal distribution curve in order to prove that the tests measure accurately without an undue number of exceptions in individual cases. The normal distribution curve, as applied to grades of human intelligence, assumes that the majority of individuals have a middle or average grade of intelligence, and that the number with an intelligence below this average equals the number with an intelligence above the average grade. More definitely, Binet and Simon and others assume that the majority of children tested should test out mentally at age, and that the number of retarded should equal the number of advanced. We will give the results on the distribution curves, and discuss the validity of the several assumptions

that are involved. It will be shown, first, that this method of testing the accuracy of the tests is entirely too rough and wholly inadequate to indicate anything more than that the tests give on the whole more or less accurate results, and that the degree of accuracy thus proven is less than is generally conceded to the scale; that as a means of detecting the smaller inaccuracies that we now wish to know of this method is worthless. It will be shown, secondly, that the assumption as to the majority passing at age is entirely inadequate as it stands, and that the assumption as to the equality of the number of retarded and advanced is probably wrong in the first place. It will be shown, thirdly, that the procedure in getting results and the forms in which the results have been stated heretofore are in themselves inadequate to show the real facts in regard to the distribution curves.

a. The distribution curve for the scale as a whole. Some authors have massed the results for all the ages together in computing the distribution curve for the mental ages, and simply determined the total number of children mentally at age, the total number retarded or advanced one, two, etc., years. It has been pointed out that results thus treated can not show the real accuracy of the tests, but that the figures must be given separately for each chronological age. This will be discussed further in a moment. The results will first be given in this form, for they bring out some facts that can best be shown in this way. The following table gives a comparison of my results with those of other authors.

TABLE VII

|                 | No. Cases | % Retarded | % At Age | % Advanced |
|-----------------|-----------|------------|----------|------------|
| Kuhlmann (1)    | 554       | 16         | 65       | 19         |
| Kuhlmann (2)    | 580       | 31         | 35       | 34         |
| Binet-Simon     | 142       | 30         | 48       | 22         |
| Goddard         | 1332      | 37         | 42       | 21         |
| Terman & Childs | 259       | 25         | 45       | 30         |
| Bobertag        | 161       | 25         | 52       | 23         |

In this table the ages of six to twelve alone are considered, excepting in the case of Bobertag's results, where the ages are from 5 to 12, inclusive. It was noted before that the mental age at thirteen, and in a smaller degree at twelve and eleven even, is very apt to be too small because the scale does not ex-

tend beyond the thirteenth year. To include the thirteenth year would have erroneously increased the percentage of retarded children. The figures for the different authors are all derived from tables they give, except in the case of Bobertag, who gives his results in the form used in this table. In the first set of my figures, in which 65 per cent. pass at age, fractions of a year in both the age and mental age are taken into account in classifying each child as "retarded," "at age" or "advanced." In the second set of figures in which 35 per cent. pass at age fractions of a year are dropped in both age and mental age. In making comparisons between figures in this table all the varying conditions under which the results of the different authors have been obtained and the different ways in which they have been expressed must again be carefully considered. When this is done it is seen at once that counting fractions of a year in both the ages and the mental ages is of the greatest importance in deciding the present question. In my own results, when all other conditions remain exactly the same, the percentage passing at age drops from 65 per cent. to 35 per cent. when these fractions of a year are dropped. The next poorest in the table is the 42 per cent. in Goddard's results, which is the only other case in which these fractions were left out of account for both ages and mental ages. In Binet-Simon's, Terman and Childs' and Bobertag's results the chronological ages are all more or less accurately taken into account. Terman and Childs considered half years in the mental ages in addition. This makes their results rank above those of Goddard in this table, though it was seen before that in the agreement of average age and average mental age they ranked considerably below those of Goddard. Those of Binet-Simon, and of Bobertag rank above those of Terman and Childs because in the latter case the children were not selected with reference to average normality, combined with the fact that there were several examiners, some of whom probably lacked in training. Those of Bobertag, again, rank above those of Binet-Simon because the children were still more accurately selected, only those who did average school work and were in the grades in which they belonged, being chosen by Bobertag for these figures. The first general conclusion

from Table VII, therefore, is that unless fractions of a year in both ages and mental ages are taken into account, and unless the children are more carefully selected with reference to normality than has been done the results can be of no great value for an accurate determination of the percentage of children who pass at age, etc., with the tests. With reference to the effect of the revision of the scale, we are left with two alternatives. The second set of my figures, in which 35 per cent. pass at age, may be compared best again with those of Goddard, the only difference in the conditions here being in the examiners, as already noted. Since the revised tests give the poorer showing, it seems that we have to attribute it to either the revision or to the examiners. Considering the results of the revised tests in connection with the previous question, the presumption is in favor of the revision, which then means that lack of training of the examiners produces frequent errors in the mental ages of the individual children examined. The degree of this influence can not be shown from the present analysis, since the revised tests may in themselves give much or only a little less frequent errors in the mental ages than the 1908 scale.

b. Distribution of mental ages for each age. The differences in the percentages passing at age for the different authors might be due to the same factors which were found to be responsible for differences in the agreement between the average ages and the average mental ages. The percentages not passing at age might be the result of the scale measuring too high at the lower end and too low at the upper end. This is without doubt in some degree the case. We see, therefore, the necessity of considering this distribution curve separately for each chronological age. We shall in consequence expect that, since the number of retarded does approximately equal the number of advanced when the results of all ages are considered together, the number of advanced will be larger than the number of retarded for the lower ages, and smaller than the number of retarded for the higher ages. However, the range and frequency of variation of the mental age from the age in the individual children may come about mostly independently of this connection, as was al-

ready discussed above. We will give next the distribution curve for each age separately.

Terman and Childs, Bobertag, and Stern, have all noted that in the results obtained the advanced exceeds the retarded in number for the lower ages, and the retarded exceeds the advanced in number for the upper ages. Our own results on this are given in Tables VIII to XI. Table VIII gives the number of children for each chronological age who pass at age or are retarded or advanced one, two, etc., years.

TABLE VIII

|    | -4 | -3 | -2 | -1 | 0  | +1 | +2 | +3 | +4 |
|----|----|----|----|----|----|----|----|----|----|
| 6  |    |    |    |    | 24 | 12 | 1  | 1  |    |
| 7  |    |    |    | 4  | 61 | 12 | 5  |    |    |
| 8  |    |    |    | 9  | 63 | 14 | 8  | 1  |    |
| 9  |    |    | 2  | 10 | 51 | 25 | 3  |    |    |
| 10 |    | 1  | 8  | 7  | 53 | 11 | 2  | 2  |    |
| 11 |    |    | 4  | 14 | 64 | 6  |    |    |    |
| 12 |    | 1  | 7  | 24 | 42 | 1  |    |    |    |
| 13 |    | 2  | 21 | 25 | 21 |    |    |    |    |

The first vertical column on the left gives the approximate ages of the children, from six to thirteen years. Those called six years old, for example, ranged from five years and six months to six years and five months, inclusive, the average age of this group of 38 being 6.16 years, as given in Table I. In computing the amount a child was retarded or advanced the ages used were exact to within half a month, and the mental ages were exact to within a fifth of a year, or 2.4 months. As in the preceding tables, a child is regarded as passing at age if he is retarded or advanced less than a whole year. A child is then counted as one year retarded if the retardation is one year or over and less than two years, and so on. In Table IX are given the percentages for the figures in Table VIII.

TABLE IX

|    | % Retarded | % At Age | % Advanced |
|----|------------|----------|------------|
| 6  | 0          | 63       | 37         |
| 7  | 5          | 74       | 21         |
| 8  | 10         | 63       | 24         |
| 9  | 13         | 56       | 31         |
| 10 | 19         | 63       | 18         |
| 11 | 20         | 73       | 7          |
| 12 | 43         | 56       | 1          |
| 13 | 70         | 30       | 0          |

These last two tables show with reference to the revised scale what others have pointed out in regard to the 1908 scale. The number of advanced exceeds the number of retarded for the lower ages, and the retarded exceeds the advanced for the higher, a result of the scale being too easy on one end and too difficult, and also too short, on the other end. In this is seen the error of drawing any conclusion from the results for all ages considered together. A comparison of these figures with those of others, when given separately for each age, becomes very involved again in attempting to determine the relative accuracy of the revised and the 1908 scale, because of the varying conditions with which we have to contend. But we may give the data in order chiefly to bring out more clearly what is required in order to determine the present question as to the frequency and range of error in the mental ages obtained with the tests. The exact amount of variation of the mental age from the age is not readily seen from merely inspecting such figures as are given in Tables VIII and IX. In order to make comparison easier we will use some index of variation. This may be obtained by dividing for any age the total difference in age and mental age by the total age of the cases considered. Thus, taking the age of ten in Table VIII, for illustration, the total difference in age and mental age is 1 times 3, plus 8 times 2, plus 7 times 1, plus 11 times 1, plus 2 times 2, plus 2 times 3, equals 47, to be divided by 10 times 84, equals .056, or 5.6 per cent., which is the index of variation, combining range and frequency of variation into one index. Using this index throughout, we obtain the following table of indexes of variation, comparing our results with those of others. The indexes given for  $K^1$  are for the figures in Table VIII. In these the fractions of a year in the ages and mental ages are taken into account. The indexes for  $K^2$  are for my results when fractions of a year in mental ages are dropped, the fractions of a

TABLE X

|       | 6    | 7   | 8    | 9    | 10   | 11  | 12  | Av.  |
|-------|------|-----|------|------|------|-----|-----|------|
| $K_1$ | 7.5  | 4.5 | 5.5  | 5.5  | 5.6  | 2.9 | 4.7 | 5.2  |
| $K_2$ | 3.1  | 2.8 | 6.5  | 6.4  | 6.4  | 4.1 | 8.3 | 5.4  |
| $K_3$ | 11.8 | 9.4 | 15.6 | 13.6 | 10.1 | 5.9 | 9.3 | 10.8 |

|         |      |     |     |     |     |     |      |     |
|---------|------|-----|-----|-----|-----|-----|------|-----|
| G.      | 13.6 | 7.8 | 9.1 | 8.5 | 7.8 | 9.5 | 12.7 | 9.9 |
| T. & C. | 7.2  | 7.8 | 8.7 | 5.8 | 4.6 | 6.5 | 10.6 | 7.3 |
| B.-S.   | 8.9  | 9.5 | 4.4 | 5.6 | 6.1 | 4.1 | 9.9  | 6.9 |
| B.      | 6.5  | 7.7 | 7.1 | 3.5 | 6.9 | 6.7 | 4.8  | 6.2 |
| A. D.   | 9.1  | 8.2 | 7.3 | 5.9 | 6.4 | 6.7 | 9.5  |     |

year in the ages being kept, thus making these indexes more directly comparable with those of Binet-Simon, and of Bobertag. The indexes for  $K^3$  are for my results when fractions of a year are dropped in both the ages and the mental ages, making these indexes more directly comparable with those of Goddard. The accuracy of the indexes for the results of Terman and Childs probably suffers somewhat because the median age was used as the average age in multiplying by the number of cases to get the total age. But they are more accurate than they would have been if the ages had been used as exactly 6, 7, etc., years, and it makes the results more comparable with those of  $K^1$ . For  $K^3$ , G., B.-S., and B., the ages were taken as exactly 6, 7, etc., years. This is of course inaccurate for  $K^3$  and G., the exact ages being higher, but it makes the results more comparable with each other. It is accurate for B.-S., and B., since the ages of their children were exactly 6, 7, etc., years. Thus, we may compare the indexes of  $K^1$  with those of T. and C., of  $K^2$  with those of B.-S., and B.; of  $K^3$  with those of G. To help in judging the validity of these comparisons, and to more readily detect the factors most responsible for large indexes of variation, we may add the following summary of the conditions that acted for and against variations.

|       | Against   | Rank | For   |
|-------|---|------|---|
| $K^1$ | Exact ages<br>Exact mental<br>ages<br>Revised scale | 1    | Many, and untrained examiners<br>Non-selection of children                    |
| $K^2$ | Exact ages<br>Revised scale                         | 2    | Many, and untrained examiners<br>Inexact mental ages<br>Non-selected children |



|                |   |   |   |
|----------------|---|---|---|
| K <sup>3</sup> | Revised scale   | 7 | Many, and untrained examiners<br>Inexact ages<br>Inexact mental ages<br>Non-selected children |
| G.             | Few, partly<br>trained examiners                                  | 6 | 1908 scale<br>Inexact ages<br>Inexact mental ages<br>Non-selected children                    |
| T. & C.        | Few, partly trained examiners                                     | 5 | 1908 scale<br>Slightly inexact ages<br>Slightly inexact mental ages<br>Non-selected children  |
| B.-S.          | Two trained examiners<br>Exact ages<br>Selected children          | 4 | 1908 scale<br>Inexact mental ages   |
| B.             | One trained examiner<br>Exact ages<br>Carefully selected children | 3 | 1908 scale<br>Inexact mental ages   |

We may use the average indexes of variation given in the last vertical column on the right in Table X as a means of comparing the revised scale with the 1908 scale, and to show the relative importance of the different factors producing variations. The most striking result is then the fact that the revised scale falls from the first to the seventh or last in rank by the change of two factors, dropping fractions of a year in the ages and the mental ages. From this fact alone it follows that Goddard's results can not be considered on this question of the range and frequency of error in the mental ages, since he has not taken fractions into account in either age or mental age. The same is in a smaller measure true of the results of Terman

and Childs. Here are combined in the influences of dropping small fractions of a year in the mental ages and of the errors introduced by the necessity of my using their median ages in place of the average ages. It is noteworthy that Goddard's and Terman and Childs' results rank sixth and fifth, respectively, in order with reference to range and frequency of error in mental ages. This leaves the comparison of the results for  $K^2$  with those of B.-S., and B. Cancelling out the factor of "exact ages," which is common to all three, leaves the influence of the "revised scale" for  $K^2$  against the influence of "expert examiners," and "selected children" for B.-S. and B. Since the variations are second in rank for  $K^2$  as compared with the third and fourth rank for B., and B.-S., the conclusion is suggested that the revision of the scale has been more influential in reducing range and frequency of error in the mental ages than have the factors of the examiners, and the selection of the children with reference to normality. This conclusion is made somewhat more plausible by the fact that the revised scale gives careful, detailed directions on how to give each test and how to interpret responses, which are lacking in the 1908 scale. This, of course, reduces the importance of the training of the examiner, and leaves only the factor of the selection of the children with reference to normality. This conclusion is, however, probably too favorable to the revision of the scale. Its favorable showing in this comparison is in part due to the fact that the revised scale tends to measure too high rather than too low more than does the 1908. This was seen in comparing the average ages with the average mental ages, above. Hence, dropping the fractions in the mental ages as is here done in the results for  $K^2$  is particularly favorable for the revised scale. In this connection it may be noted that the variations that we are here discussing seem after all to be largely dependent on and due to the same factors causing difference between the average ages and average mental ages. In the last horizontal column in Table X are given the average indexes of variation for all the results of the 1908 scale, excluding those for  $K^1$ ,  $K^2$  and  $K^3$ . These average indexes of variation decrease at first, reaching their minimum of 5.9 for the ninth year, and then increase again, thus running roughly paral-

lel with the lack of agreement between average ages and average mental ages.

The final conclusion up to this point from this lengthy and involved analysis, with reference to the improvement the revision of the scale has made, is simply that the revised scale has been shown to give more accurate results on the whole, especially for the higher ages, and that it also reduces the frequency and range of error or both in the mental ages when individual cases are considered. No exact idea of the amount of improvement can be gained from the complexity of the conditions under which comparisons had to be made. We are now ready to discuss further the validity of the assumptions made that the majority of children should pass at age, and that the number of retarded should equal the number of advanced, and the general usefulness of the distribution curves to show the accuracy of the tests. These and other questions will be taken up in a second article.\*

\*This will appear in the next number of this Journal.

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## EDITOR

**A. C. ROGERS, M. D.** - - - - - Faribault, Minn.

## ASSISTANT

**FRED KUHLMANN, Ph. D.** - - - - - Faribault, Minn.

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**WM. HEALY, M. D.** - - - - - Chicago, Ill.

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## NEWS AND NOTES

When on the 24th of October, 1913, the spirit of Mrs. Isabel C. Barrows passed on to the great beyond, this busy world lost a beautiful character and her friends a source of never-ceasing inspiration.

It would be presumptuous for the writer to attempt any adequate tribute to her memory. Her field of interest and influence was wide; her activities varied; her spirit and her interest in legitimate human endeavor were all-embracing.

Mrs. Barrows was a woman of versatile accomplishments; in her younger days a missionary to India, educated in medicine with special training for treatment of the diseases of the eye and ear; an accomplished linguist; a versatile writer and an expert stenographer and reporter. There was a charm to her writings throughout which was always a spirit of broad, human sympathy—an appeal for the helpless, the persecuted and the misunderstood.

Mrs. Barrows was an honorary member of the American Association for the Study of the Feeble-Minded, and for over fifteen years was its reporter, attending its meetings regularly and thoroughly interested in all its work. Her death brings a particularly deep sorrow to the older members who will gather at Columbus, Ohio, in June.

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On December 30, 1913, E. B. Huey, Ph. D., died at Connell, Washington. He had left his work with Adolph Meyer at the Johns Hopkins Hospital and gone to the western coast to regain his health. Readers of this Journal will long remember Dr. Huey as among the first and foremost students of mentally defective children, for which work he was admirably equipped. His first professional training was in experimental psychology, which soon took an educational turn in a series of special studies on the psychology of reading. His book under this title is the standard reference on the subject. Having become interested in mental pathology, he resigned as head of psychology and education at Pittsburgh University to study in France, particularly with Janet, and on his return took up the work of clinical psychologist at the Illinois State institution for feeble-minded. A monograph on "Mentally Defective Children," and a collection of much unpublished data and experience were the results of about a year's stay at this institution. He then went to Johns Hopkins University for further study with Dr. Meyer and as lecturer on clinical psychology, until a failing health compelled his resignation. A few months before his death a manuscript, almost ready for press, of a book on clinical psychology, was destroyed in a fire. Dr. Huey's career reflects an integrity of purpose, as do his writings an unusual sanity of judgment. In his death the cause of clinical psychology, and the study of the feeble-minded, especially, suffer a heavy loss.

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# JOURNAL OF PSYCHO-ASTHENICS

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## SURGICAL STERILIZATION AS A EUGENIC MEASURE

BY BLEECKER VAN WAGENEN.

The Eugenics section of the American Breeders' Association at its annual meeting last year appointed a committee of its members to study and report upon practical methods of eliminating defective germ plasm from the human population. The committee consists of:

Bleecker Van Wagenen, Chairman, New York City,

W. H. Carmalt, M. D., New Haven, Conn.,

Everett Flood, M. D., Palmer, Mass.,

H. W. Mitchell, M. D., Warren, Pa.,

H. H. Laughlin, Secretary, Cold Spring Harbor, N. Y.

The committee has associated with itself in a consultative and advisory capacity the following specialists:

Medicine: Dr. L. F. Barker, Johns Hopkins University.

Surgery: Dr. Alexis Carrel, Rockefeller Institute, New York City.

Physiology: Prof. W. B. Cannon, Harvard University.

Biology: Prof. H. J. Webber, Cornell University.

Psychology: Dr. H. H. Goddard, Vineland Training School, N. J.

Psychiatry: Dr. Stewart Paton, Princeton University.

Thremmatology: Prof. Raymond Pearl, Maine Agricultural College.

Anthropology: Prof. A. F. Chamberlain, Clark University.

Criminology: Judge W. W. Foster, Court of General Sessions, New York.

Sociology: Prof. F. H. Giddings, Columbia University.

Political Economy: Prof. James A. Field, University of Chicago.

Law: Hon. James M. Beck and Mr. Louis Marshall, of the New York Bar Association.

History: Dr. James J. Walsh, Dean of Fordham Medical College, New York.

Statistics: O. P. Austin, Esq., Chief of the Bureau of Statistics, Washington, D. C.

Public Affairs: Prof. Irving Fisher, Yale University.

Woman's Viewpoint: Mrs. Caroline B. Alexander, Hoboken, N. J.

Immigration: Prof. R. De C. Ward, Harvard University.

The committee is seeking and receiving assistance from many sources, both public and private, in contributions of data pertinent to its investigations, and it seeks the co-operation of anyone having such to impart. What I have to report is the work of this committee.

#### **A. Nature of the Problem and Reasons for the Investigation.**

In recent years society has become aroused to the fact that the number of individuals within its defective classes has rapidly increased both absolutely and in proportion to the entire population; that eleemosynary expenditure is growing yearly; that some normal strains are becoming contaminated with anti-social and defective traits; and that the shame, the moral retardation, and the economic burden of the presence of such individuals are more keenly felt than ever before. Within the last three years especially there has been a marked development of public interest in this matter. The word "Eugenics" has for the first time become known to thousands of intelligent people who now seek to understand its full significance and application. Biologists tell us that whether of wholly defective inheritance or because of an insurmountable tendency toward defect, which is innate, members of the following classes must generally be considered as socially unfit and their supply should if possible be eliminated from the human stock if we would maintain or raise the level of quality essential to the progress of the nation and our race:

1. The Feeble-Minded, using the term generically.
2. The Pauper class, pauper families through successive generations.
3. The Criminaloids, persons born with marked criminal tendencies.
4. Epileptics.
5. The Insane (excepting certain forms of acute insanity showing no hereditary taint).
6. The Constitutionally Weak, or asthenic class.
7. Those predisposed to specific diseases or the diathetic class.
8. The Congenitally Deformed.
9. Those having defective sense organs, such as the deaf-mutes, the deaf and the blind, or the Kakaisthetic class.

With the statistics at present available it is impossible to give an accurate statement of the numbers within each of these classes in the United States. From studies of such figures as can be obtained from public sources, using the figures of the 11th, 12th and 13th United States special censuses as a basis, it seems safe to conclude that nearly one per cent. of the total population is under custodial care and control in institutions all the time. This is a shifting and constantly changing population so that many more than that number in the aggregate are inmates of institutions in the course of any one year. Outside of institutions it seems conservative to estimate from three and a half to four per cent. equally defective persons not under custodial care, while upon the borderlinē, just above this class there are probably several millions (perhaps four to five millions) or say five per cent. more who are barely able to maintain themselves or who just succeed in abstaining from acts which would bring them into the custody of the State. These are the people of inferior blood, who are so interwoven in kinship with those still more defective that they are wholly unfitted to become the parents of useful and valuable citizens. They carry germ plasma more or less charged with defects and unless their matings are with better strains deterioration is sure to follow in their family lines. Thus we conclude that approximately ten per cent. of our population, primarily through inherent defect and weakness,

are an economic and moral burden on the ninety per cent. and a constant source of danger to the national and racial life. It is impossible to measure the industrial and social handicap caused by these individuals. But just as the leaders of successful human endeavor exert an influence altogether incommensurate with their number, so this class, doubtless, constitute a drag on society of similar magnitude.

### B. Proposed Remedies.

Along with penal, hospital and eleemosynary care, a remedy for these conditions is being sought on every side. Among others, the following have been proposed as fitted to promote the desired end.

1. Life segregation (or segregation during the reproductive period).
2. Sterilization.
3. Restrictive marriage laws and customs.
4. Eugenic education of the public and of prospective marriage mates.
5. Systems of matings purporting to remove defective traits.
6. General environmental betterment.
7. Polygamy.
8. Euthanasia.
9. Neo-Malthusian doctrine, artificial interference to prevent conception.
10. Laissez-faire.

Needless to say that all but three or four of these are generally rejected as unsuited to the purpose or against the moral convictions of our day. Which of these remedies shall be applied? Shall one, two or several be made to operate? What are the limitations and possibilities of each remedy? Shall one class of the socially unfit be treated with one remedy and another with a different one? Shall the specifically selected remedy be applied to the class or to the individual? What are the principles of compromise between conservation and elimination in cases of individuals bearing a germ-plasm with a mixture of the determiners for both defective and sterling traits? What are the criteria for the identification of individuals bearing defective

germ-plasm? What can be hoped from the application of some definite elimination program? What practical difficulties stand in the way? How can they be overcome? These and other questions arise, hence this investigation. For the present we have selected the second named proposition (sterilization) for our study as being the one about which least is generally known both in practice and effects, and which is yet being actively urged for immediate legislation authorizing its practice.

### C. Laws.

Already eight states have laws which authorize or require surgical sterilization of certain classes of defectives and degenerates. They are: Indiana, Connecticut, Washington, California, Iowa, Nevada, New Jersey and New York—the first (Indiana) enacted in 1907, the last (New York) in 1912. The types of persons upon whom these operations may be performed as prescribed in the various statutes vary as follows:

1. Confirmed criminals or those having confirmed criminal tendencies are named in all the laws. In five, rapists are specifically mentioned.
2. Idiots, imbeciles, feeble-minded, in six.
3. Insane, in four.
4. Epileptics, in two.

In Iowa, habitual drunkards, drug fiends, syphilitics and certain prostitutes and procurers are included. In New Jersey and New York the words "and other defectives" is added. In Connecticut and California the inmates of certain specified state institutions are those prescribed. In all the laws the determination of the individual to be operated upon is committed to a commission or board. In New York and New Jersey provision is made for a review of the commissioners' decisions by a county court or the supreme court, with appointment by the court of counsel to represent the person affected at a hearing. New York, New Jersey, Indiana and California leave the character of the operation to be determined by the board or commission. Connecticut prescribes vasectomy and oophorectomy. Iowa prescribes vasectomy and salpingectomy. Washington and Nevada specifically prohibit castration.

Except in Indiana and in California little or nothing has been done to carry out these laws. Their constitutionality is in question. Attorneys-general for the several states do not seem anxious to defend suits and appear to encourage delay in putting the laws into operation, and in Indiana, where for seven or eight years vasectomy was practiced without law and exclusively at the request or with the consent of the person operated upon, and for two years thereafter under the law of 1907, compulsorily, there have been no operations since 1909 except a very few cases at their own request, not ten in all. In New Jersey a suit is pending in the Supreme Court to determine the right of the State to have sterilized certain confirmed criminals, insane, epileptics, and feeble-minded persons who have been certified by the State Commission as proper subjects for the operation. As the entering of a suit stays the execution of the law, it seems likely that these cases may not be pressed for trial for some time. In the State of Washington a test case has recently been made and the Supreme Court has just decided that the law is constitutional. In this State and Nevada sterilization is specifically prescribed as a penalty, in addition to prison sentence. The Court held that the operation of vasectomy was neither cruel nor inhuman and therefore justifiable as a penalty for certain crimes.

#### **D. Methods of Surgical Sterilization.**

In the male, castration or removal of the testicles.

Vasectomy or excision of a portion of the vas deferens.

In the female, ovariectomy or removal of the ovaries.

Salpingectomy, or excision of a small portion or the whole of the fallopian tubes.

Vasectomy and salpingectomy are the simpler methods and those generally adopted, unless a diseased condition requires the removal of the organs.

#### **E. Effects of Sterilization.**

Many thousands of sterilization operations have been performed by surgeons in both private and institutional practice. As a rule, these operations have been for purely pathological reasons, and it has been found difficult to obtain authentic records of their more remote effects. As a matter of fact, records of the effects of such operations extending over a long period of



time do not exist to any great extent. As a rule, when a patient has made a satisfactory recovery, the case is dismissed, and the surgeon has no further knowledge of it. The committee has, however, begun the collection of first hand records of cases of sterilization by different methods on different types of people at different ages, and in different conditions. It has obtained authentic case histories of individuals surgically sterilized of the following classes: The insane, epileptic, feeble-minded, criminals, (it must be remembered that this class is often also feeble-minded, insane or epileptic) and persons of normal minds, both male and female. In most of these classes the number of records is yet too few to afford a proper basis for general deductions. The largest number in one class is about forty male criminals, chiefly inmates of the Indiana State Reformatory. Many of these individuals were also of defective mentality and bad inheritance. Two members of the committee visited the Indiana State Reformatory and witnessed three vasectomy operations by Dr. H. C. Sharp, surgeon at the institution. More than a dozen previously sterilized men were privately examined by the committee with the view to determining their physical, mental and moral make-up with especial reference to the effects of vasectomy on the sexually perverted instincts and practices and a trained investigator was left in charge to complete the case history records, and to study the family histories of the vasectomized men in their home territories. The total number of operations in the institution by Dr. Sharp, so far as records show, was about 300, of which 176 were prior to the enactment of the law, invariably at the request of the men operated on. The other 125 cases were compulsory under the law and were in the years of 1907 and 1908, since which time the practice has been discontinued, except for a very few cases operated at the request of the prisoner himself. As there is not time to give full data I will give one or two fairly typical histories in each of the classes before mentioned and will begin with one of the young criminals in the Indiana Reformatory.

B. W. is of Dutch-American descent, born in the United States, age twenty-four at the date of operation, which was performed in the Jeffersonville (Indiana) Reformatory in 1906 at

his own request after hearing the subject discussed by two officers of the institution. Wished to decrease his sexual desires, which were constant and excessive, also to avoid the possibility of having children. He was a sexual pervert of a pronounced type, and realized (he said) his bad heredity, and did not wish his kind perpetuated. He has been a criminal from his earliest days, and much of his life had been spent in institutions. No education, except as obtained there; of slow intelligence. He claimed (1912) to have improved in mind and body after vasectomy, to have gained in weight, in strength, and in power to concentrate; sleeps better, less nervous, decrease of over-sexuality. Still sexually perverted, however, as shown by his conduct in prison now.

C. R. is of English-Irish descent. American born, aged twenty-eight when operated on in January, 1908, against his wishes and protest in the Indiana Reformatory. His family was fairly well-to-do and there is no reported history of criminal ancestry. The boy early left home and has apparently an unconquerable wanderlust which brought him into trouble in other ways. Was convicted of grand larceny. After the operation his weight increased some forty pounds. His muscular and mental strength, he says, decreased but his general health was better, specifically of the kidneys. He claims that no change in sexual desires or habits resulted. He is now somewhat reconciled in regard to the operation, but thinks that in some indefinite way it harmed his health. There is no evidence of this, however.

Those two cases illustrate fairly the majority of those operated on in the Reformatory. Dr. H. C. Sharp who performed these operations was the pioneer in this line in this country. He claims that primarily it was done for the benefit of the individual and he believes that in nearly every case it did have a distinctly beneficial effect on body and mind, whatever may be the expressed opinion of the individual himself.

The next two cases were insane persons.

M. H. came to this country from Ireland some ten years ago. Had been in an insane asylum there fifteen years before for eighteen months. Married shortly after coming here, a woman of low grade, mentally, probably feeble-minded, but fond

of her children and keeping them and her house fairly clean and orderly. He was of good habits and a steady worker earning about ten dollars a week. There have been eight children, the first born before marriage, and one miscarriage. At the time of the onset of this psychosis, which was allied to the manic-depressive type, twins were born. Three of the children are feeble-minded, three died in infancy, one at three years of age, one child of five years may be normal, but it is too early to determine. After a few months treatment it was found that the patient had apparently recovered, and was able to go back to the industrial world, and it was learned that he could secure his old position at ten dollars a week. Meanwhile the patient was a state expense, his family was dependent upon charity. The only objection to his release was the danger of propagating more children of the sort already produced. Vasectomy was proposed, but he objected. The wife was brought in, and the patient, the hospital authorities, and the wife held a conference. Vasectomy was finally agreed to by the man and was performed (April, 1912) and the patient discharged. No report of after effects has as yet been received, but we shall get one later.

This quite recent case illustrates how institution authorities may promote eugenic ends by sterilizing certain types of defectives without the aid of a specific sterilization law, and be entirely within their legal rights as custodians of defectives and degenerates, and protectors of society.

H. P. is a female patient in the State Hospital for the Insane of California, twenty-two years of age and single. The operation of double salpingectomy per laparotomy was performed on her in August, 1911, against her wishes, but with the consent of guardians. Complete recovery in a few days reported. Ten months later patient said she felt weaker than before operation, attributed by the physician to unusually hard work in the laundry. Mentally she was more composed and tractable. Before operation had much edema of feet, which condition improved; also frequent dysmenorrhea; since markedly less.

The next is the case of a high grade, feeble-minded, epileptic girl, twenty-three years of age. The operation (salpingectomy) was performed at request of her parents to overcome if pos-

sible excessive masturbation, to which they attributed the epileptic seizures which began when she was seven. Menstrual periods had been irregular and scant and her physical condition was poor. Convalescence was satisfactory. Mentally, she became more contented and cheerful. Physically, generally improved. Menses more regular and normal, gained in weight and strength. So far as can be ascertained, the bad habit is no longer practiced.

Another case is of an epileptic young woman of twenty-three, erotic and sexually uncontrolled. She had induced several abortions and there was considerable prolapsus of the uterus. She readily consented to the operation. Both tubes were severed and sewed to the outer wall of the uterus, which, with the ovaries, were replaced in normal position. Since, the patient's general health has improved. Epileptic seizures reduced from one every two or three weeks to one every three or four months. In this case subsequent sexual characteristics are not reported.

H. W. L., now thirty-two years old, is a private patient in Massachusetts State Hospital for the Feeble-Minded and Epileptic. He had been subject to epileptic seizures since early childhood. No alcoholism, epilepsy or feeble-mindedness found in his family history. Was the second child of parents twenty-five and twenty-two years old respectively, who subsequently had five more children, understood to be all normal. Epilepsy was attributed to lancing of the gums when six months old, which brought on convulsions. Became a persistent masturbator and during adolescence had occasional irregular sexual intercourse (and frequent night losses). At eighteen was castrated. He had by this time mentally deteriorated considerably and appeared feeble-minded, his mental condition being that of a child of twelve. (Since then, night ejaculations, which had become excessive, no longer occur, though he states that he still has priapisms). His general health has not materially changed and his convulsions have continued with about the same frequency as before the operation.

From one institution for the feeble-minded we have reports of seven boys who were castrated on account of excessive masturbation and for eugenic reasons. Their ages ranged from eight to thirty-one years. Results varied, but in only one case

was there any marked change, physically or mentally. In that case there was distinct quieting down, more tractability and good humor. In one case, it is stated, masturbation was continued occasionally, and one a high grade boy (thirty years old) subsequently ran away and got married.

Of operations on persons of normal minds and not criminals we have reports of a considerable number, mostly women. All those operations were for pathologic reasons and it is not, perhaps, worth while to give specific cases here. Instead, we will sum up as best we may with the material at hand. This is only a preliminary report. We have touched in a desultory way upon a few of the many aspects of our subject worthy of consideration. While we do not feel justified in offering conclusions based upon the data so far accumulated, we may say tentatively that such as we have seem to indicate:

1st. That the sterilization of the adult male by vasectomy is a simple, practicable method of preventing procreation by him without otherwise interfering with his sexual functions but that it is not certainly permanent in this respect. Castration only is sure.

2nd. That sterilization of the adult female by either salpingectomy (ligating or excising,) ovariectomy or hysterectomy, or all three, is never wholly free from danger to life or to disturbance of other bodily and mental functions. Modern aseptic surgery and hospital care have greatly reduced these dangers, but they still exist to some extent.

3rd. That sterilization of adults by any of these processes does not appear greatly to modify previous sex characteristics, and habits. In females sexual passion is said to be sometimes increased; in males more often somewhat mitigated.

4th. That there is little probability that sexual immorality would be encouraged or increased as a result of the sterilization of those manifestly unfit for parenthood. Our investigations indicate that such persons seldom are deterred from immoral practices by any consideration which sterilizing would remove.

5th. That our knowledge is, as yet, so limited that only a few types could safely be designated at the present time as suitable for compulsory sterilization. Individuals of those types would

have to be carefully selected by competent authorities and would generally require more or less custodial care throughout life, whether sterilized or not, but their sterilization would be a valuable insurance against unworthy progeny, and so eugenically of value.

6th. That vasectomy may become a eugenic measure of considerable value if practiced under the general protection of law, but by permission and with the consent of the individual (or his guardian's) who is unfitted for parenthood, instead of by compulsion. That this consent can often be obtained when conditions warrant it has been clearly shown.

7th. That the sterilization laws already enacted in the United States will have to undergo vigorous attacks before the highest courts before many more compulsory operations are performed, with the probability that there will eventually be material modifications of them.

## INFANTILE CEREBRAL PALSIES

BY H. G. HARDT, M. D., *Lincoln, Ill.*

Under this head may be classified symptoms of a varied pathological lesion in the brain occurring in infancy. We may have a monoplegia, hydrocephalus, hemiplegia, paraplegia or diplegia. Some writers dwell more particularly upon one form than the separate forms which are clinically demonstrable.

Synonyms—Little's Disease—paraplegia, cerebral spastica (Heine); acute encephalitis; cerebral paralysis of children, spastic infantile hemiplegia (Benedikt); cerebral palsies of childhood; hereditary spastic paraplegia; hemiplegia in children; feeble-minded paralysis; spastic cerebral paralysis; congenital spastic paraplegia in children; infantile spastic diplegia.

### A. Etiology.

Those who make a study of neurology have divided the etiological factors into three groups; prenatal, natal, and post-natal. The forms according to Dieulafoy, of chronic encephalitis in children from birth to the period of the second dentition are often described under different names, according as they are designated by their anatomical lesion (hemorrhage, softening, porencephaly, lobar sclerosis), or by their major clinical syndrome, (athetosis, hemiplegia, paraplegia, spasmodic diplegia, or Little's disease). They deserve to be studied as a whole, because even though they present, as in the adult, varying symptoms according to the localization of the lesions, their course is marked by a common clinical basis. Paralyzes with contractures, and intellectual troubles that may be slight or may end in low grade idiocy are the elements of the syndrome common to almost all forms of chronic infantile encephalitis. The fact that the brain of the child is incompletely developed at the time when the lesion makes its appearance accounts for this special clinical process. Let me add that the after-effects of infantile sclerosis may appear in youth in the form of epilepsy. The

writings of Bourneville and of Strumpell have helped to elucidate these forms of infantile encephalitis. Their natural history has been accurately classified by Brissaud.

Cerebral infantile palsies have been described under three groups, or rather the etiological factors have been placed in one of the three above mentioned divisions. The cases to be considered have occurred among the feeble-minded. One hundred eighteen cases have been clinically examined. Of this number 61 are female and 57 male. This shows that the relative frequency is practically the same for either sex. Of the total number there were 25 hemiplegic, 78 diplegic, 14 hydrocephalic and 1 paraplegic. Of this number 33 are subject to epilepsy and 44 had athetosis. In regard to number or relative position of birth, 39 were first born; 26 second; 16 third; 6 fourth; 8 fifth; 14 sixth and later; the others unknown. Among these the condition was first noticed in 98 during the first year, 5 during the second, 6 during the third, 3 during the fourth, none the fifth, and 6 unknown. In regard to the gestation and labor the records show 99 to have been without instruments and apparently normal; 19 abnormal or with instruments. The onset in 50 had an initial convulsion, the remainder not stated. The assigned causes were: Prolonged labor, fall on head, fright, presence of an imbecile brother, smelling camphor, operation for tumor, morphinism, syphilis, consanguinity, measles, meningitis, alcoholism, tuberculosis and heredity, as well as fall during gestation, chloroform, otitis media, grief, malnutrition. In 25 per cent. of the cases a positive history of tuberculosis and alcoholism could be obtained. In 16 per cent. meningitis was the evident exciting cause. Among the cases there were three blind and one deaf. In most of the cases the peculiarity dated from birth.

### B. Pathology.

The lesions found in the various clinical groups to be described, depend upon the severity of the clinical manifestation, whether it be a convolution, lobe, hemisphere or a large area that is involved. The sclerosis and atrophy which form the scar of the insult have much the same characteristic in all the different forms mentioned. It has, therefore, been spoken of by many



writers as a "sclerotic atrophy." The primary or initial cause many times remains clouded in obscurity, because no known warning of the time when it may have been brought about, whether due to a trauma or disease was observed. In many post mortems, blood clots, the result of a hemorrhage, as well as cysts of various sizes have been repeatedly found. These failed to absorb because of being walled in and remain as a residue. The most characteristic universal finding is the marked contraction of the area or areas involved due to the sclerosis and resulting atrophy. In a resume of 343 cases by Allen Starr the conditions found were as follows:

Porencephalus, a localized atrophy or agenesis, leaving a cavity in the cerebral hemisphere, which may be deep enough to open into the ventricle, 132 cases.

Sclerotic atrophy, an atrophic condition of the brain with an increase of connective tissue and disappearance of the nervous elements, affecting both hemispheres, or one only, or a part of one only, or limited to small areas in various parts, 97 cases. This is the terminal result of encephalitis and often results from maldevelopment from unknown causes acting on the foetus.

Maldevelopment and apparent atrophic condition of the minute structures of the hemisphere, chiefly cortical, the cells resembling those of a newborn child, but with no apparent gross defects in the brain, 32 cases.

Atrophy, consequent upon the condition of softening produced by embolism or thrombosis, and limited in extent to certain arterial districts of the brain, 23 cases.

Meningo-encephalitis, a condition shown by thickening and adhesion between the pia and the brain, with destruction of the cerebral cells and atrophy of the cortex, 21 cases.

Cysts lying on the brain and producing atrophy by pressure, or associated with atrophy due to the original lesion of which the cyst remains as a trace, 14 cases.

Hemorrhage on or in the brain as shown by the remains of a clot, or by haematin staining of a cyst, of the pia, or of the sclerotic tissue, 18 cases.

Hydrocephalus with extreme dilatation of the ventricles, so that the brain tissue is reduced to a mere wall about the cavity, 5 cases.

Little's Disease—English, German and American writers are prone to use the term Little's disease in childhood. French writers, of the Salpetriere school especially, insist upon a clinical form of spastic diplegia to which they give the distinctive name of Little's disease, after the London surgeon who among the first called specific attention to this class of disorders. As these cases referred to present certain definite characteristics and a more hopeful future than the others, they merit separate mention. The initial condition is a premature birth or the birth at term of a markedly undeveloped child. This means a defective pyramidal tract in the spinal cord and brain. Such children usually weigh less than four pounds. Spasticity results in the territory of the lower neuron from the lack of control due to the undeveloped condition of the super neuron. These children are rigid from birth, but the mental qualities are not necessarily diminished, and if they survive, the tendency is to continuous improvement as the pyramidal tracts develop. This development is never complete, but continues up to the age of full growth. The motor condition is one of pure spasticity and there is no tendency to athetoid movements or epileptic attacks. The gait remains more or less spastic through life, which may be a long one marked by ordinary or even brilliant mental activity.

The following is taken from Little's "Deformities of the Human Frame," 1853, Pp. 115-118.

"The next is a severe case of spastic rigidity of limbs, with impaired intellectual development, from asphyxia neonatorum, with the particulars of which I was furnished by the parent, a surgeon in Oxfordshire.

"The male child of young and healthy parents, in consequence of protracted labor (it being the first child) was born asphyxiated, and continued so for above half an hour. The pressure, not instrumental, over the occiput, was to such an extent as to cause congestion and ultimately sloughing over the occipital protuberance. For several days the child was very feeble and unable to cry aloud; during the first two days he had sev-

eral convulsions, and did not appear likely to survive. However, after the bowels had been well cleared by an enema, he rallied, and was pretty well, although small in size. The only thing remarkable at this time was an awkwardness in taking the breast, so that during the first fortnight he was obliged to be fed from a bottle. At the age of two months he began to increase in size, and up to end of first year was remarkable for robustness. When nursing him, it was noticed that he did not retain his seat, but slipped off the hand or knee of the nurse. The period of dentition passed over without any disagreeable symptoms. His temper was always good. He appeared rather backward in the use of the legs, but this was attributed to his great weight.

"At two years of age the attention of the parents was drawn to his inability to walk or creep on the floor, as also to his backwardness in the use of the tongue and right hand. He was now put under the influence of electro-magnetism three times a week of sufficient strength to be disagreeable to an adult; and during the summer was dipped in cold water every morning. He was once during this year subjected to a course of calomel for a period of three weeks, which induced jaundice, and made him much thinner. His bowels after this were continually costive, but he took very little medicine. He occasionally awoke in the night apparently frightened and was a considerable time getting quiet again.

"Soon after his third birthday he could say 'papa,' imitate the cow, and knew several letters of the alphabet; and in the early part of the year could raise himself on his knees to crawl, which was performed principally by the left leg. He could also distinguish several of the animals in a Noah's ark, and when he made an effort to do any thing difficult, a spasmodic twitching of the flexors of the right leg was observed, which was increased when he attempted to use it. He sat chiefly on the left nates.

"During the fourth year he was able, when the weight of the body was supported, to advance his legs regularly for progression. When on his knees he is apt to change position by throwing himself back, and sitting with the legs under him to play with his toys. During this year he was taken to Brighton, and bathed in the sea daily for six weeks. On his return his

father perceived a great change for the better; there was greater animation, and the child was able to articulate the name of the bathing-woman. The mental powers began slowly to improve. About this time he was put under a course of steel medicine, which improved his health, and enabled him to use his legs more for support.

"At the commencement of his fifth year he was put under a course of sulphate of zinc, beginning with gr. i, and gradually increasing to gr. v. He had a boot with an iron attached outside to prevent a contraction of right foot, and a baby-jumper for exercise. He continued to improve up to his fifth birth-day when he was able to walk slowly round the table, depending very much for support upon his hands, more particularly upon the left. He also pushes a chair before him, and can ride a rocking-horse without assistance. He uses his right hand better, can set up some of his toys, and also can feed himself with it. On taking up a ball, he can now, when he attempts to throw it, relax his hold of it. He begins to connect his words, and says many of them distinctly; he can pronounce each letter of the alphabet, and knows the majority of them. He can also count up to 40, repeat the Lord's prayer, and a verse or two of hymns, with but little assistance. His health is at present good. He sleeps well, and eats heartily. His body is in good condition, and well formed; and there is no malformation about the spine or limbs. During the last twelve months he has been rapidly improving."

July 29th, 1851. The author's journal states he is now between five and six years of age, a favourable instance of this severe class of case. The right side is most affected. Although he walks in the manner of *T. equinus*, the feet can be flexed with the hand. The left hand appears little affected, the right pronation preponderates over supination; the flexors are less troublesome than pronators. The father's report, Dec. 1852, is "that he has mentally much improved; writes with right hand on a slate tolerably well; but being obliged to use so much force (to overcome the spasm) he does not do so well on paper."

### C. Diplegic Form.

Both sexes are alike affected and the peculiarity is noticed

as a rule during the first year and can usually be traced from birth; alcoholism has been a big factor when associated with tuberculosis and defective heredity. Many have a microcephalic cranium with small cephalic index. In the cases noted forty per cent. had a form of strabismus. In the facial group of muscles frequently twitching is noticed more so on one side than on the other. There is a weakened muscular tone of both extremities, especially the lower. The movements of the hand and fingers are clumsy, things reached for are often knocked over and in many cases a beautiful play of athetoid movements is shown in the limb reaching for an object as well as in those which should be at rest. Usually associated with athetosis of the fingers and toes there is a hyperextensibility; frequently one side is better developed than the other. More or less spasticity can be elicited in the upper extremities. At times marked choreiform movements are present. In the lower extremities the spasticity as a rule is more marked; more often exaggerated on the one side and the feet frequently assume a form of talipes, most often talipes varus, and an adduction of the knees. Articulation almost becomes a stammer due to spasticity. The special senses, hearing, smelling, tasting, feeling and seeing, remain in fairly good order. There is very little change in the reaction to electric stimulation. The cutaneous sensibility shows little impairment unless the mental grade is so low as to influence it. No marked disturbance occurs in deep sensibility, such as tenderness over nerve trunks. There is more or less muscular inco-ordination. Among the centrifugal apparatus there is noticed a frequent disturbance of the ocular muscles. The optic axes are often not parallel and myopia is a common finding; the pupils react to light and accommodation. One eye at times follows the light with full and steady movements. Frequently one naso-labial fold will show more tone than the other. In testing the grip with a dynamometer one side often shows more weakness than the other, corresponding with the finding in the extremity. Speech shows at times the involvement of the tongue, lip, and throat muscles. The superficial reflexes, i. e. corneal, supra-orbital, epigastric and abdominal, are usually present and normal, and nearly always the plantar is present and normal. The

deep reflexes, i. e., biceps, triceps, supinator longus and patellar are exaggerated, sometimes more actively on one side than the other. Again at times the spasticity is so great and the parts held so rigidly that no reflex action could be elicited, but later obtained under more favorable circumstances. Ankle clonus was very irregular. The Babinski sign showed no regularity; in some cases it is found in both feet; some in one foot and again in some typical cases it is not found at all.

All the cases from which this abstract was made were able to swallow well, some were fed but the feeding was made necessary because of the low mental state. A careful Binet-Simon examination was made of the mental intelligence in all cases and it varied from a low grade idiot, having an intelligence of less than one year, to a high grade moron, having a mental intelligence of eleven to twelve years.

The spasticity may be so marked in the lower extremities as to incapacitate the individual to walk, and locomotion by means of a wheel chair is necessary. Some of the cases so deformed lie on their back in bed, legs crossed and with hands and fingers performing bizarre movements, also with their head; in fact, any part of the upper extremity. Flipping thread, saliva and lint spinning is a frequent employment and apparent enjoyment. Automatisms are common. When standing the feet tend to spread and a knock-knee formation is seen. The body balance is poor. The skin is usually soft and sweaty. A peripheral cyanosis is frequently noted. In about 10 per cent. of the cases there was associated epilepsy.

Mary M. Father a lather. At the age of 31 he was killed by a street car. Mother was a dipsomaniac. A brother of the father committed suicide, and another one was tuberculous. Mother's father died of tuberculosis. Mother's mother died of cancer. This child was admitted October 31, 1904. She was first in the order of birth, being weak and ill-nourished; weighed three pounds at birth. She did not walk until three years of age. The skull measurements were as follows:

|                               |          |
|-------------------------------|----------|
| Head circumference .....      | 49.5 cm  |
| Naso-occipital arc .....      | 27.9 cm. |
| Naso-bregmatic arc .....      | 10.1 cm. |
| Bregmato-lambdoid arc .....   | 15.9 cm. |
| Binaural arc .....            | 27.5 cm. |
| Antero-posterior dia .....    | 17.2 cm. |
| Greatest transverse dia ..... | 13.9 cm. |
| Binauricular dia .....        | 13.5 cm. |
| Cephalic index .....          | .80      |

The head is microcephalic. Forehead is slightly retreating. There is more freedom of the facial muscles on the right side than on the left. In expressing emotion or in talking the left side of the face moves more freely and earlier than does the right side.

Eyes. There is an alternating divergent strabismus present.

Ears. Left ear is larger than the right. Lobules are adherent.

Upper Limbs. This child is right handed. The right arm is smaller in girth and somewhat weaker than the left.

Circumference of right arm.....7½ in.

Circumference of left arm .....8 in.

Circumference of right forearm.....7½ in.

Circumference of left forearm .....8½ in.

There is a marked athetosis of the fingers, and they are hyperextensible and slightly clubbed.

Lower Limbs. While sitting the child holds her knees close together and the feet are extended with the heels raised and the toes touching the floor in the position of talipes equinovarus. When she stands squarely on both feet, both feet show a marked pes planus. She stands with knees adducted. The right leg is slightly larger and better developed than is the left. The right calf measures 11½ inches, the left calf 10¾ inches. This contrasts with the development of the upper extremities, where the left arm is larger and stronger than the right.

This child is under-developed and stands markedly stooped, leaning somewhat to the right side. She stands with her

knees close together and feet planted squarely on the floor. There is a slight left lateral curvature of the spine.

Gait is very spastic, almost a shuffling run. When asked how she feels replies, "All right."

Breathing becomes spasmodic on exertion or excitement. Her mouth is nearly always open. This may be due to paralysis of the facial muscles.

Heart. Negative.

Nervous System. Smell. Camphor is recognized, etc. Vision practically good. Hearing good by rough tests.

Cutaneous Sensibility. Touch and pain sensibility are normal. Localization of touch is good. Temperature and stereognostic sensibility are fair.

Deep Sensibility. There is no tenderness of nerve trunks. Muscular co-ordination is poor.

Cranial Nerve. Ocular group. Pupils are regular. They react sluggishly to light and accommodation. The optic axes are not parallel. One eye at a time follows the light with full, steady movements. One eye seems to be used about as easily as is the other.

The left naso-labial fold is slightly more marked than is the right. The voice is loud and harsh. The speech defect is probably almost entirely due to the paralysis of the tongue, lips and throat. The grip of the right hand is weaker than the left. The hands show a jerky tremor. There is athetosis in both hands, feet and face. All deep reflexes are exaggerated, more so on the right side. Superficial reflexes are present.

She passed 28 tests of 55 required. Intelligence 6 plus. Retardation 19; high-grade imbecile.

Byron W. Father is a hotel clerk. Mother is tubercular. One sister, more helpless than this child, died at three years of age. Child was admitted April 23, 1902. He was born in 1905. He was second born; labor normal and born at full term. He is cross-eyed. Child is emaciated, practically no muscular development. Bones are easily palpated and outlined. The child's head is elongated vertically. Eyes are open and staring; there is a tendency to protrusion of lower maxilla. Child lies in a position of general flexion with either



one hand or the other in its mouth most of the time.

Eyes show a nystagmus and an internal strabismus of the left side. Corneal reflex present.

Ears are large and protrude.

Teeth are poor and decayed, irregular. Palate is high. Face is expressionless. Thyroid is atrophied.

The chest presents a frustum appearance. The lower ribs flare very markedly. General emphysema. The abdomen is distended. Pubic hair is absent.

Upper Limbs. There is a tendency to flexion of the forearms on the arms with adduction of the arms on the chest, held more or less rigid, and are spastic with athetosis of the fingers, more so on the left side.

Lower Limbs. There is flexion of the legs on the thigh with abduction of the foot with marked flat-foot present. The parts are very rigid and spastic. Gait is spastic.

There is peripheral cyanosis.

Vision is apparently present but nothing definite can be obtained in regard to what extent.

Hearing is present but degree and acuteness is difficult to determine.

Phonation and articulation are defective.

Cutaneous sensibility is present.

Superficial reflexes: Corneal, supraorbital, epigastric, abdominal and plantar reflexes are present.

Deep Reflexes: Biceps, triceps, supinator longus and patellar reflexes are exaggerated on left side.

The movements of the facial muscles are impaired. There is a marked tremor of the eyelids.

There are automatic, bizarre movements of the head, arm, hands and fingers. The muscle tone of the lower extremities is poor.

He has been an inmate for 11 years. He spends practically all of his time sitting in a chair, performing automatic movements; scratches the skin of his hands and face until it bleeds at times; becomes excited and is noisy and restless.

The muscular growth has been poor. He is very untidy and has to be fed. When he does not spend his time in his chair

he usually is in his bed and is quite destructive to his clothing and bedding.

Diagnosis: Infantile Cerebral Palsy. . Spastic diplegia type.

He passed four Binet tests of the 55 expected at his age. His intelligence is approximately at the level of one year, plus, indicating a retardation of 16 years, plus. Ranks as a middle grade idiot.

His speech is about entirely absent. No understanding, no words; grunts and laughs.

#### **D. Hydrocephalus.**

This condition is observed macroscopically by the unusual size of the cranium, which attracts attention. This is caused by extreme dilatation of the ventricles, the brain tissue thereby being reduced to a mere wall surrounding the cavity containing an accumulation of serum. This condition results from a previous injury or disease producing an accumulation of fluid in the lateral ventricles in excess of what can be cared for, causing an internal hydrocephalus. It has been frequently associated with rickets. The fluid appears to be secreted by the ependyma of the lateral ventricle and may vary in amount from a few ounces to five or six pints. It is identical with the cerebro-spinal fluid. The distention of the brain causes a distention of the skull before bony union and formation is complete and this produces, as was before mentioned, macroscopic appearance of a hydrocephalic skull.

In the 14 cases which are part of the 118 cases of infantile cerebral palsy there were 9 male and 5 female. Two of the females had associated epilepsy and five of the males were similarly affected.

Freda K. This case was admitted May 13, 1902. She was second born; delivery normal. Peculiarity first noticed at six months of age; large head. She had convulsions. Her weight was 136 lbs. Stretch of arms, 157 cm.

|                               |          |
|-------------------------------|----------|
| Circumference of skull .....  | 60.5 cm. |
| Naso-occipital arc .....      | 35.5 cm. |
| Naso-bregmatic arc .....      | 14 cm.   |
| Bregmatic-lambdoid arc .....  | 13 cm.   |
| Binauricular arc .....        | 36.5 cm. |
| Occipito-frontal dia. ....    | 19.5 cm. |
| Binauricular dia. ....        | 15.6 cm. |
| Greatest transverse dia. .... | 18.1 cm. |
| Cephalic index .....          | .92      |

Head is macrocephalic; dome-shaped; bulges more on the left side. Right side of face is larger. Alternating divergent strabismus. Tongue protrudes slightly to the left. Breast, large and pendulous. In the upper extremities there is a tremor of both hands; also a stiffness and awkwardness of the fingers with hyperextensibility. Peripheral cyanosis is present. She sits quietly all day in an invalid chair. Is unable to dress or undress; is untidy.

Lower Extremity. Both patellae are drawn above the normal position. She sits in a stooped position for hours in an invalid chair, unable to walk, but can move about a little on her knees. She says, "I feel all right."

The cutaneous sensibility is hypersensitive. Right side of face moves more freely than left.

The superficial reflexes, that is, the corneal, supraorbital, epigastric and abdominal, as well as the plantar, are present and normal.

The deep reflexes, biceps, triceps and supinator longus and patellar are exaggerated. Marked spasticity of both legs is easily demonstrated.

She passed 16 of the 60 required tests, indicating an intelligence of 4 years and a retardation of 21 years, and would grade, according to this intelligence scale, as a low-grade imbecile.

Willie H. This case was admitted August 8, 1901. He is now 31 years old. He was first born of four children. His twin brother died about three days of age. The grandfather and mother and one brother had consumption. Father was alcoholic. The child is said to have been peculiar from birth;

head large, legs drawn up, spine curved. He was able to feed himself, tie a shoestring; was bright, cheerful, interested in play. The assigned cause was lues, causing a dropsy of the brain. He plays the zither. The child could not hold its head up until the second year.

|                               |           |
|-------------------------------|-----------|
| Circumference of head .....   | 66.25 cm. |
| Naso-bregmatic arc .....      | 16 cm.    |
| Naso-occipital arc .....      | 37.5 cm   |
| Bregmatic-lambdoid arc .....  | 15.5 cm.  |
| Binauricular arc .....        | 38.1 cm.  |
| Antero-posterior dia. ....    | 23.75 cm. |
| Binauricular dia. ....        | 16 cm.    |
| Greatest transverse dia. .... | 17.5 cm.  |
| Occipito-frontal dia. ....    | 28.75 cm. |
| Cephalic index .....          | .737      |

The teeth are wide apart. There is exophthalmos and divergent strabismus. Ears are large, left more so than right. Lower limbs are contracted; knees adducted, feet abducted; talipes valgus; marked contraction of hamstring muscles. This child sits in a wheel chair, frequently cross-legged; he is unable to walk. Genitalia are atrophied. There is a right scoliosis in the dorsal region and kyphosis. Very recently there was a grand-mal epileptic seizure. There is a marked dyspnea due to the deformity of the chest. There is a general weakness in the muscular tone. The cutaneous sensibility is good. There was no especial tenderness of the muscles or nerve trunks to pressure. With the dynamometer, according to Smedly's instrument, right shows 34 kilos, left 33. There is a marked spasticity in the lower limbs and muscular weakness in the upper; there is atetosis and clumsiness of the fingers. A general tremor, almost choreic, is present. He is a good conversationalist, is neat, cheerful, and is anxious to be quizzed. According to the Binet-Simon test he graded as a high-grade moron.

Regarding the other twelve cases, I may say that in each case the ocular apparatus showed involvement, usually an alternating divergent strabismus. A very common finding is a pes planus, talipes valgus and talipes equinus. Over half of them were unable to walk and spent most of their time in

wheel chairs, suffering with marked paraplegic symptoms where the knees were adducted and the feet abducted. The reflexes were more exaggerated on one side than the other but the deep reflexes could almost always be found exaggerated while the cutaneous sensibility remained unimpaired. In regard to the anthropometric data the occipito-frontal circumference varied from 57 to 67 cm., and the cephalic index from .73 to .920. The mental intelligence, according to the Binet-Simon scale, ranged from a low-grade imbecile to a high-grade moron. The greatest predominant factor in the etiology was an alcoholic and tubercular history of the parents. Difficult or instrumental labor played a small part only. As a rule the lower extremities were more involved than the upper; in fact, one boy was able to play a zither with considerable ease. The general body tone is relaxed. In the male the skin was loose and in the female there was a general flabbiness. In three other cases there was a marked paraplegia. The patellae were drawn above their normal position and a talipes of one form or another deformed the feet. In trying to stand there was usually a buck-knee present

#### E. Hemiplegia.

The hemiplegic form of cerebral palsy affords an interesting group for study as an opportunity presents itself for relative comparisons, and as a rule the evidence is so conspicuous as to be readily recognized even to the extent of causing marked deformity of the affected side, showing the characteristic features of hemiplegia as seen in adults. If developed in infancy it most commonly is ushered in by convulsions. The onset is followed by a period of unconsciousness of varying duration. Frequently death occurs at this period. If they survive the onset a paralysis is noted which tends to some improvement, especially in the lower limb, then a stationary state is arrived at and, as the child develops a corresponding apathy or undevelopment of the affected side, becomes more noticeable. The patient soon learns to do varied movements by the assistance of the sound side. The paralysis can be easily traced along the whole side affected and as time goes on contractures of the various tendons cause deformities of the side, especially noticeable in the hand and foot, forming a talipomanus of the hand and a

talipes equino varus of the foot. The girth of the muscles is lessened, the length of the affected bones are shortened, and a dwarfed or atrophic condition of the affected part results. The nerve tone and blood supply to the affected side is impaired, a cyanosis and thin skin, rather pale and bluish is seen. The electrical reactions show no change on the affected side. The superficial reflexes are usually present and normal, while the deep reflexes are exaggerated, more pronouncedly on the affected side, especially the patellar; the upper and lower limbs show clumsiness and spasticity.

Their mental attitude is a restless, irritable one, much like that of an epileptic. The good side is called on to help the affected side. After the stationary stage has been arrived at very little is hoped for in the line of treatment. Strumpel says "the whole course of the disease suggests very strongly an acute encephalitis." Sachs and Osler, from the study of a large number of cases, find that the cause of the paralysis is almost always hemorrhage or embolic softening. In the hemiplegic cases the arm usually recovers less than the leg or face and the athetoid condition is commonly confined to it.

Laura R. was admitted October 16, 1905. Age, fifteen; born in the United States. Single. Condition dates from early childhood. First noticed at age of one and a half years. After severe attack of otitis media, a defect was noticed on the left side of the body. This child was third born and the second living child. Labor was normal; weight at birth eight pounds. She had a convulsion at the time of the otitis media; also tuberculous glands of the neck at that time. Father is living; age forty-two. Mother died of heart disease; age thirty-three. At the fourth month of gestation the mother received a severe fright. One brother died the day after his birth; one sister still born; another died an hour after birth; one sister living, fifth born.

At three years of age she had chorea; at four epileptiform convulsions. In the seven years' stay at the institution one epileptic convulsion has been recorded of a grand mal type.

Height, 153.6 cm. Weight 117½ pounds.

|                               |          |
|-------------------------------|----------|
| Skull circumference .....     | 52.7 cm. |
| Naso-occipital arc .....      | 29.8 cm. |
| Naso-bregmatic arc .....      | 12 cm.   |
| Bremato-lambdoid arc .....    | 12.7 cm. |
| Binauricular arc .....        | 27.3 cm. |
| Antero-posterior dia. ....    | 17.1 cm. |
| Greatest transverse dia. .... | 16.5 cm. |
| Binauricular dia. ....        | 16.1 cm. |
| Cephalic index .....          | .96      |

The head is of brachycephalic type, left side smaller, but the muscles of the right side move more freely. The lips are normal. Teeth, second dentition. Soft palate is normal; hard palate is broad. The tongue is small, pointed, and has a few small transverse fissures. The left side of the tongue is smaller than the right, and has a somewhat shrunken appearance, suggesting atrophy. Thyroid is small. The left side of the chest is much less developed than the right.

Upper limbs. The left arm is deformed and weaker than the right. The left side is spastic, the hand carried flexed on the wrist—talipomanus. The forearm is extended on the arm. There is athetosis of the left hand and the fingers are hyperextensible.

|                                      |        |
|--------------------------------------|--------|
| Circumference of right arm .....     | 9¾ in. |
| Circumference of right forearm ..... | 9½ in. |
| Circumference of left arm .....      | 9 in.  |
| Circumference of left forearm .....  | 8¼ in. |

The right hand is well formed, the fingers short and stubby.

Lower Limbs. The left foot shows a talipes valgus deformity. Both legs show weakness.

|                                    |         |
|------------------------------------|---------|
| Circumference of right thigh ..... | 18¼ in. |
| Circumference of right calf .....  | 13 in.  |
| Circumference of left thigh .....  | 17½ in. |
| Circumference of left calf .....   | 12¼ in. |

There is a general leaning to the left side. There is a right scoliosis and thoracic kyphosis present. The gait is peculiar. The left leg swings from the hip after the manner of hemiplegia, but the right leg is apparently weak, the foot dragging forward and seldom lifted from the floor.

General nutrition is good. When asked how she feels, replies, "All right." Chest expands fairly well, better on the right than on the left side. The optic axes are not parallel. There is no nystagmus. The muscles of expression, both the upper and lower groups, appear to act better on the left than on the right side. Articulation is poor, being largely of the type of infantile stammer. There are many small choreiform movements involving both extremities on the left side, but not affecting the right side except for an insignificant tremor of the right hand. There is athetosis present in both extremities on the left side. Superficial reflexes are present and normal. Plantar reflex is absent on the left side. Deep reflexes are present and exaggerated, more so on the left side.

This girl has an epileptic suggestion, violent at times. She is idle. She controls choreiform and contracture movements by grabbing her left arm with her right hand. Her right leg holds left leg in check. She helps to dress and undress herself and is tidy in her personal habits.

Diagnosis: Infantile cerebral palsy—left hemiplegic, with some weakness on right side.

She passed 26 tests of 50 required. Intelligence of 6 years. Retardation 8. Ranks as a high-grade imbecile.

Max T. This case was admitted February 11, 1907. His father is a woodturner, age thirty-two. Mother, aged twenty-nine. Child was first born; labor normal. At the age of one year he had meningitis with convulsions and on the third day of the disease got paralysis on the right side. It was supposed at the time that he was infected through vaccination. He had convulsions twice a year until 1906.



|                               |                     |
|-------------------------------|---------------------|
| Height, 62½ inches.           | Weight, 117 pounds. |
| Stretch of arms .....         | 59¾ inches          |
| Circumference of skull .....  | 51.2 cm.            |
| Naso-occipital arc .....      | 31 cm.              |
| Naso-bregmatic arc .....      | 11.9 cm.            |
| Bregmato-lambdoid arc .....   | 12.4 cm.            |
| Binauricular arc .....        | 39.5 cm.            |
| Antero-posterior dia. ....    | 16.2 cm.            |
| Greatest transverse dia ..... | 14.7 cm.            |
| Binauricular dia. ....        | 14.3 cm.            |

Face is prognathous. The features are course. The right naso-labial fold is more pronounced. He has internal strabismus. The tongue protrudes to the left. The left shoulder girdle is larger than the right, the left clavicle is one inch longer. The left scapula is larger.

Upper Limbs. The right arm is moderately flexed at the elbow, shows marked retardation of development and impaired function. Right arm 22½ inches long, left arm 26¼ inches long. Circumferences of right arm and forearm about one inch less than left arm.

Lower Limbs. The right leg is 1¾ inches shorter than the left. Circumference of right thigh, 16½ inches; left thigh, 17½ inches. Circumference of right calf, 11¼ inches, of left, 12¼ inches. Lower group of facial muscles does not move as well on the left side as on the right. The general musculature on the left side is quite good. The right side of the body is in a state of spastic paralysis. The dynamometer showed the grip to be 25 kilos in the left hand and 2 kilos in the right. The fingers of the right hand can be hyperextended. The gait is that of a hemiplegic. Electrical reaction is not affected. Babin-ski sign is present in the right foot.

Superficial reflexes are present and normal. Deep reflexes are exaggerated, more so on the right side. He is tidy; has a strong, violent temper, and is easily disturbed.

In a resume of twenty-five cases the conditions found were as follows:

9 males:

Hemiplegics—right side, 5; left side, 4.

Athetosis—6.

Talipomanus—6.

Talipes—7.

Order of birth—4 second born; 4 first born; 1 no record.

Onset, convulsions—8.

Strabismus—5

Heredity—5.

Epilepsy—6.

Normal labor—5.

Intelligence:

Real Age.

Mental Age.

19

10

13

5

12

8

One middle-grade imbecile.

One middle-grade moron.

One low-grade moron.

One moron.

Five no tests made.

16 females:

Hemiplegics—right side, 11; left side, 5.

Athetosis—13.

Talipes—13.

Talipomanus—12.

Order of birth—4 first born; 2 second born; 3 third born; 1 fourth born; 2 fifth born; 2 ninth born; 2 no record.

Onset, convulsions—13.

Intelligence:

Real Age

Mental Age.

|    |   |
|----|---|
| 19 | 1 |
| 18 | 5 |
| 15 | 7 |
| 15 | 2 |
| 36 | 6 |
| 30 | 7 |
| 14 | 3 |
| 15 | 2 |
| 14 | 6 |
| 15 | 5 |
| 30 | 5 |
| 23 | 1 |
| 25 | 6 |
| 25 | 3 |

Six middle-grade imbeciles.

Four low-grade morons.

Two high-grade idiots.

Two low-grade idiots.

Two no record.

#### F. Paraplegia.

As the name implies, this is a paralysis of the lower extremities of an infantile cerebral variety. This condition is more rare than the other forms of cerebral palsies, although with the hydrocephalic form a paraplegia is frequently associated. The symptoms are very similar to those of a spastic cerebral diplegia, with the exception that there is little or no demonstrable involvement of the upper extremity, while the lowers may be affected in degree from a spasticity shown in the muscle tone and the spastic gait to a complete loss of function, making ambulation impossible and confinement in bed or movement by wheel chair necessary. The intellect is less impaired and the genitalia remain juvenile. There is marked contrast in some cases between the body above the hip and below the hip. Above, the body matures with age; below the hip an atrophic state is noted. The limbs are usually closely adducted, the knees touching, while the feet tend to abduct and form one

of the talipes. The limbs are held quite rigid and there is a marked exaggerated reflex.

The fingers, hands and arms of the upper extremities may perform very delicate movements. The condition does not improve physically nor is there a progressive mental growth, consequently this condition should not be confused with "Little's Disease," in which there is a steady physical and mental improvement. Of the 118 cases examined only one was a paraplegic, although in several hydrocephalics there was an associated paraplegia.

Nellie P. Admitted November 1, 1905. She was born June 22, 1892.

Father died at sixty-eight of some "nervous trouble." He also had tuberculosis. He was a drunkard before the birth of this child. The mother is an epileptic and has been an inmate of a state asylum. Father's father was a drunkard; the mother's father died of "consumption." Both father's and mother's families had cases of scrofula and consumption.

The two first children of the family died two and ten hours after birth. The fourth child is living and reported well. This child was third born. The mother was particularly abused at second month of pregnancy. Peculiarity said to have dated from birth; convulsions. At fourth month of age the child had a skin eruption. At third month of age she had brain fever. She began to talk at four years. She has had otitis media. She did good work in school.

Height, 153.5 cm. Weight, 115½ pounds.

Stretch of arms ..... 157.2 cm.

Head circumference ..... 55.2 cm.

Naso-occipital arc ..... 30.4 cm.

Naso-bregmatic arc ..... 13

Bregmato-lambdoid arc ..... 12.4 cm.

Binauricular arc ..... 31 cm.

Occipito-frontal dia. .... 19.2 cm.

Greatest transverse dia. .... 15 cm.

Binaural dia. .... 13.1 cm.

Cephalic index ..... .77

The head is symmetrically formed. Features are good. The

right corner of the mouth is drawn down slightly. Lips are normal. Eyes are good. Ears are good; also tongue and thyroid.

The upper limbs are normally and symmetrically formed; strength is good. The fingers show hyperextensibility. The lower limbs are stiff and spastic. Both feet show pes planus, which is more severe in the left foot. Skin is of good color. The body is of normal size. Body balance is relaxed. There is a right lateral scoliosis present. Gait is extremely spastic, both feet being dragged and the body being swung from side to side in walking. When asked how she feels, replies, "All right." Her pulse is 80.

Nervous System. Smell. Asafoetida is called "sassafras." Cinnamon is called "peppermint." Wintergreen she does not recognize. Oil of peppermint is recognized. Vision is practically good. Sugar, salt, quinine and vinegar are all recognized by taste and named. Hearing is slightly defective. Cutaneous sensibility and deep sensibility are negative. Muscular co-ordination is fair. Pupils are negative. Voice is smooth, articulation defective, suggesting infantile stammer. Deglutition is normal. Superficial reflexes present and normal; deep reflexes are exaggerated.

This girl is well oriented as to time, place and person. She has a good memory of recent and remote events. She is trustworthy and an excellent worker. She makes beds and helps in store-room. Is able to dress and undress and helps other children.

Diagnosis: Infantile cerebral palsy, paraplegic type.

### G. Diagnosis.

The diagnosis of infantile cerebral palsy is comparatively simple if a careful study is made of the history of the family and particularly the mode of onset and the time of appearance of the symptoms. The great majority of the cases occur during the first year, or the symptoms show themselves during that time. In the hydrocephalic form the dome-shaped cranium of abnormal size with usually a divergent strabismus and spasticity of greater or less degree with mental impairment and weakened lowers, can hardly be mistaken for anything else. The

hemiplegic type associated with spasticity and the juvenile history of development are clear. The diplegias may take a longer time to clearly demonstrate as age advances; the athetosis, chorea, exaggerated deep reflexes and spasticity of both upper and lower extremities, often more exaggerated on one side with more or less mental retardation, present a clear clinical picture. These diplegias are not to be confused with Little's disease, which is an improvable form of cerebral insult where little or no mental deterioration remains and a steady improvement physically and mentally is the rule. The onset is usually a premature birth or a birth at term of a markedly undeveloped child.

#### H. Prognosis.

The different forms of the clinical picture of the cerebral insult are very prone to remain stationary as far as improvement is concerned. The greatest mortality is apt to occur when the initial convulsion introduces the clinical picture during the first year of infancy. From that time on until adult life the defect is brought more in contrast with the better developing part and accentuates the finding.

The life of those who reach maturity is brought to a close by some intercurrent affection, usually tuberculosis or a pneumonia, or a status or exhaustion from epilepsy in those who are so afflicted.

#### I. Treatment.

Infantile cerebral palsies begin at birth, or as soon as the earliest indications of cerebral involvement can be ascertained. Paralysis early may be so extensive as to prevent normal nursing and artificial feeding may have to be resorted to; also the alimentary tract should be carefully studied; free and open catharsis is indicated. The food should be simple and nutritious as well as easily assimilated, as the general nutrition tends to be poor. Early manipulation and massage of the bones, joints, muscles and other tissues will assist the circulatory apparatus in toning and enervating the various tissues. As time goes on the proper culture of speech, and sense training is indicated. Walking is usually delayed and sometimes never becomes possible. Perambulators and other walking devices are in use. In the hydrocephalic, trephining and tapping of ventricles has been

attempted only to result in death or a refilling of the emptied cavity. In the hemiplegic form as well as the diplegic form, tenotomy, transplantation of tendons and other surgical procedures have been resorted to in order to relieve the various contractions and reduce deformities; also orthopedic appliances of many kinds can be judiciously used with much good. Many cases due to mental retardation and the expensiveness unavoidable in private care soon gravitate to larger and more charitable institutions. In the cases associated with epilepsy, more care and safeguards must be placed about them in order to prevent the accidents and injuries so common to the epileptic. The spasms or convulsions which are usually of a grand mal type are reduced by hydrotherapy or drugs, the drugs used most often being chloral, bromides, morphine and chloroform.

# WASSERMANN TESTS: SIX HUNDRED CASES OF FEEBLE-MINDED AT THE MINNESOTA SCHOOL FOR FEEBLE-MINDED AND COLONY FOR EPILEPTICS

BY A. B. MOULTON, M. D.

The work undertaken at this institution in testing our children for evidence of syphilis by means of the Wassermann reaction, an incomplete preliminary report of which affords the basis for this paper, has been undertaken as a part of the work outlined by this association,\* leading toward a more accurate and comprehensive knowledge of the factors which enter into the causation of feeble-mindedness. Our endeavor is to correlate the serological findings with the conditions determined by the field workers, and in the tables given we have indicated briefly, in so far as the cases have been investigated, their findings. Notes which tend to throw helpful side lights on the results obtained will be given in connection with the tables. This report covers the results obtained on the examination of 599 boys and one girl, the girl being included as her serum was used as one of the positive controls.

The method employed in our work has been the Noguchi modification of the original Wassermann test. The acetone insoluble fraction of tissue lipoids being used as antigen, with a human hemolytic system, inactivated serum to be tested, and for an amboceptor, the serum of rabbits immunized against human erythrocytes. The bulk of the antigen used was secured from the Rockefeller Institution through the kindness of Dr. Noguchi. That which was subsequently used was prepared in our own laboratory following the technique given in the second edition of Dr. Noguchi's book on "Serum Diagnosis." This antigen was tested against that received from the Rockefeller laboratories using the same sera. The blood to be tested was usually drawn from the subject on the day examined, though occasional-



ly it was secured the previous evening. At first we depended entirely on the natural separation of the serum, but were bothered not a little by spontaneous hemolysis, which required repeating the work. Later we allowed the blood to coagulate in the tubes, then it was centrifuged for from three to five minutes, giving a serum perfectly clear and untinted. With few exceptions, where we secured very small quantities of blood, the serum was inactivated at 56 degrees C. for twenty minutes. The Guinea pig complement was never more than 18 hours old and in most of the tests was used within six hours and when not being used was on ice. Whenever specimens were found to give positive reactions, they were tested a second time with the next lot examined. When examined the second time we used an alcoholic extract of syphilitic foetal liver as an antigen.

The results of these tests show that of the 600 specimens examined, 523 or 87 1-6 per cent. showed complete hemolysis and can safely be considered as negative, while 77 or 12 5-6 per cent. showed inhibition of hemolysis, ranging from complete arrest to a mere trace of inhibition, as is shown in the following tables. In grading the degree of hemolytic inhibition, we separated them into four groups. In the first group, as indicated in table I, we included only those where inhibition was complete. In group two, shown in table II, we included those cases where inhibition was nearly complete, with not over 15 per cent. of hemolysis, which corresponds very closely to Noguchi's weak positive. The third group comprises those cases in which less than 30 per cent. of the erythrocytes was dissolved, while in the fourth group, we included those specimens that showed over 30 per cent. of hemolysis. In studying our results, we have found one instance where two brother's sera show inhibition, one a clear cut positive with no hemolysis, while the other taken on the same day, and with the same reagents in the same set of tests showed only partial inhibition, this in view of the fact that we have no history of anti-syphilitic treatment.

Referring to table I of the sixteen cases showing complete inhibition of hemolysis, two show clear cut physical signs of lues, i. e., Hutchinson teeth, iritis and keratitis. In one instance physical signs and a positive history is present. In a fourth in-

stance there were four sibs that died within a very short time of birth and there are also four living sibs that are feeble-minded. Three others came to us from the Minnesota State Public School. To summarize, in four cases the family history shows positive or marked probability of specific infection, and in three others the complete lack of information, the children coming from the State School, where only orphans or children living under positively bad conditions are taken in, at least raises a suspicion. Further study of these families will probably shed added light on the question. In table II, comprising 17 cases, there are foundlings, one is from a thoroughly degenerated stock, with insanity in two more, a total of six. While the direct clinical evidence of personal or parental luetic infection is not so direct, there are conditions that give warrant for further study. The third and fourth tables show the same questionable conditions but they have not been studied sufficiently to know the full significance of our findings.

In the study of complement fixation in these feeble-minded conditions, certain questions arise relative to interpreting results. While the meaning of complete hemolysis as well as complete inhibition is quite clear and we may justly lay much weight upon them, what value are we to place upon the intermediate grades of hemolysis? It seems to be the general opinion where we have not over 10 or 15 per cent. hemolysis, we can in the presence of suspicious clinical conditions, consider the person luetic, but how about the others, in our particular problem of searching out and determining the relative importance of various causative factors, and where direct treatment is not the question, where shall we draw the line saying that a given complement fixation is, on the one hand specific and on the other means nothing?

TABLE I

## REACTION POSITIVE

## Complete Inhibition of Hemolysis.

| Case No. | Chrono. Age | Mental Age | Stigmata   | Notes on family history  |
|----------|-------------|------------|--|--|
| 1        | 13 3-4      | 6          |  | Sister F. M.   |
| 2        | 12          | 4          |  | Father F. M., luetic   |
| 3        | 17          | 11 3-5     | Hutchinson teeth<br>Iritis, keratitis<br>Enuciation poor | Mother ill repute<br>Father luetic<br>Father, brother and sister F. M. |
| 4        | 25          | 8          |  | A foundling  |
| 5        | 24          | 6 3-5      |  | Two sisters, 3 brothers F. M.  |
| 6        | 17 1-3      | 1-2        | Paralytic<br>Tubercular                                  | Two sisters, 2 brothers died few days<br>old                           |
| 7        | 14          | 8          |  | *M. S. P. S.   |
| 8        | 13          | 3          |  | Mother F. M.   |
| 9        | 12          | 6          | Spastic paraplegia                                       | M. S. P. S.<br>Brother F. M.   |
| 10       | 13          | 6          |  |  |
| 11       | 18          | 8 4-5      |  | M. S. P. S.  |
| 12       | 52          | 6          | Paralysis Agitans  | Father epileptic   |
| 13       | 12          | 6          | Paraplegic   |  |
| 14       | 17          | 8          | Hutchinson teeth<br>Thickened tibia                      | Brother at School for Blind  |
| 15       | 13          | 5          |  |  |
| 16       | 9           | 5-1-5      |  | Father, mother, sister and brother<br>F. M.                            |

\*M. S. P. S.—Minnesota State Public School.

| Serum strongly positive used for positive control.

|| Brother gives V. W. Positive

TABLE II

## REACTION WEAK POSITIVE

## Inhibition of Hemolysis, 85 per cent. to 100 per cent.

| Case No. | Chrono. Age | Mental Age | Stigmata             | Notes on family history                     |
|----------|-------------|------------|----------------------|---|
| 1        | 24          | 6          | Facial asymmetry     | M. S. P. S.                                 |
| 2        | 16          | 3          | Paresis lower limbs  | Sister F. M.                                |
| 3        | 16          | 8          |                      |   |
| 4        | 16          | 6          | Illegitimate         | Mother F. M.                                |
| 5        | 23          | 4          |                      |   |
| 6        | 64          | 5          |                      |   |
| 7        | 19          | 6          | Slight microcephalia |   |
| 8        | 6           | 2          |                      | Mother insane                               |
| 9        | 19          | 5          |                      |   |
| 10       | 23          | 9          | Partial paraplegia   | M. S. P. S.                                 |
| 11       | 35          | 6          |                      |   |
| 12       | 25          | 7          |                      |   |
| 13       | 29          | 5          |                      | Mother, father, brother and sister<br>F. M. |
| 14       | 15          | 9          |                      | M. S. P. S.                                 |
| 15       | 23          | 6          | Tubercular           |   |
| 16       | 18½         | 6          | Epilepsy             |   |
| 17       | 13          | 6          |                      | Father insane                               |

TABLE III

## REACTION VERY WEAK POSITIVE

Inhibition of Hemolysis 70 per cent. to 80 per cent.

| Case No.                          | Chrono. Age | Mental Age | Stigmata                       | Notes on family history  |
|-----------------------------------|-------------|------------|--------------------------------|--------------------------|
| 1                                 | 15          | 6          | Deaf and dumb                  |                          |
| 2                                 | 23          | 6          | Dwarfed                        |                          |
| 3                                 | 7½          | 4          | Illegitimate                   | Mother F. M.             |
| 4                                 | 21          | 6          | Hydrocephalic                  | Father thief             |
| 5                                 | 25          | 3          |                                | Mother F. M.             |
| 6                                 | 20          | 3          |                                | Brother F. M.            |
| 7                                 | 25          | 8          |                                | Father heavy drinker     |
| 8                                 | 26          | 6          |                                | Brother F. M.            |
| *9                                | 13          | 10-3-5     | Increased intra-ocular tension | Brother and sister F. M. |
| 10                                | 6           | 2          |                                | Mother syphilitic        |
| Note *—Brother four years younger |             |            |                                | shows clear positive.    |

TABLE IV

## REACTION FAINT OR DOUBTFUL

Inhibition of Hemolysis 50 per cent. or less

| Case No. | Chrono. Age | Mental Age | Stigmata            | Notes on family history |
|----------|-------------|------------|---------------------|-------------------------|
| 1        | 24          | 10         |                     |                         |
| 2        | 12          | 5          |                     |                         |
| 3        | 27          | 7          |                     |                         |
| 4        | 19½         | 8          |                     |                         |
| 5        | 16          | 7 2-5      |                     | Father F. M.            |
| 6        | 33½         | 7          |                     | Two sisters immoral     |
| 7        | 16½         | 10         |                     | Home conditions bad     |
| 8        | 13½         | 8          |                     |                         |
| 9        | 22          | 11         | Epileptic           |                         |
| 10       | 19          | 7          |                     |                         |
| 11       | 13          | 4 3-5      |                     |                         |
| 12       | 9           | 3 3-5      | Mongolian           |                         |
| 13       | 15          | 3          | Paresis lower limbs | Brother F. M. and Ep.   |
| 14       | 14          | 10         |                     | M. S. P. S.             |
| 15       | 32          | 3          |                     | Three brothers F. M.    |
| 16       | 56 2-3      | 2          |                     |                         |
| 17       | 28          | 7          |                     | M. S. P. S.             |
| 18       | 14          | 4          |                     | Mother and brother dull |
| 19       | 30          | 6 ?        | Deaf and dumb       |                         |
| 20       | 9           | 6 2-5      |                     | M. S. P. S.             |
| 21       | 25          | 2          |                     | Brother F. M.           |
| *22      | 18          | 3          | Deaf                |                         |
| 23       | 14          | 7          |                     |                         |
| 24       | 14          | 9          |                     | Mother dull             |
| 25       | 10          | 7          |                     |                         |
| 26       | 11 2-3      | 5          |                     |                         |
| 27       | 35          | 7          |                     |                         |
| 28       | 17          | 6          |                     |                         |
| 29       | 13          | 5          |                     |                         |
| 30       | 13          | 8?         |                     | Father F. M.            |
| 31       | 14          | 3 3-5      |                     |                         |
| 32       |             | 10         |                     | Mother blind            |
| 33       | 25          | 2          |                     |                         |
| 34       | 11          | 6          |                     |                         |

\* Cases 22 to 34 inclusive show very slight hemolysis.

## ADDITIONAL REPORT ON WASSERMANN TESTS

BY Wm. J. G. DAWSON, M. D., *Eldridge, California.*

At the last meeting of the Association, I presented a paper entitled "A Preliminary Report on Wassermann Tests." I stated that up to and including May 5, 1912, we had examined eight hundred and eighty inmates of the Sonoma State Home at Eldridge, California. Positive tests were obtained in thirty-five cases, equal to four per cent.; indefinite reactions in seventeen cases, two per cent.

Dr. Grace Linforth-Boalt, our expert in the Wassermann work, still continues the research work and from July 9, 1911, to February 17, 1913, one thousand one hundred and thirteen tests in all have been made. Positive tests were obtained in 30 males and 23 females, made a total of 53, or about 5 per cent. These 53 cases include the 35 before reported.

The prevailing ages of males were nine to thirty-eight years, oldest male (feeble-minded) giving positive reaction, forty-seven years. The prevailing ages of females were twelve to twenty-six years, oldest female (an epileptic) giving positive reaction, sixty-five years.

Nationality: American, forty-eight; Mexican, one; English, one; Portuguese, one; Italian, one; French, one.

| GRADE               | MALE | FEMALE | TOTAL |
|---------------------|------|--------|-------|
| Moron .....         | 16   | 10     | 26    |
| Imbecile .....      | 10   | 8      | 18    |
| Idio-imbecile ..... | 2    | 5      | 7     |
| Mongolian .....     | 2    | 0      | 2     |
|                     | —    | —      | —     |
|                     | 30   | 23     | 53    |

Of this number, on the male side, one was a moron mute, one a Mongolian mute; two were epileptics; five were paralytics and one was a case of athetosis. Of this number, on the female

side, one was an imbecile mute; one an idio-imbecile mute; seven were epileptics; three paralytics and one paralytic combined with athetosis.

The prevailing order of birth in the different families was as follows:

|                   |    |
|-------------------|----|
| First born .....  | 24 |
| Second born ..... | 7  |
| Third born .....  | 5  |
| Fourth born ..... | 1  |
| Fifth born .....  | 3  |
| Eighth born ..... | 1  |
| Not known .....   | 12 |
| <hr/>             |    |
| Total .....       | 53 |

Family histories in the 53 cases were as follows: Eight gave positive luetic histories; five suspected luetic histories, two of which also gave histories of feeble-mindedness in the family. In eight cases feeble-mindedness was found in the family, of which two were the brothers; six being sisters or brother or both, some of whom are in the Home. Twelve showed insanity in immediate families and two of these families had suspected luetic histories. In the remainder no family history of lues or other constitutional diseases was obtained. Two brothers, inmates, both gave positive reactions; one sister (first in order of birth) of a family of three inmates gave a positive reaction.

Fifty of the positive and fifty of the negative cases were re-examined by the Wassermann test and checked by the Noguchi test, with the following results: The negative cases were again negative with both tests. The positive cases in three instances were stronger with the Noguchi test.

The small percentage obtained of positive cases does not compare with some of the reports made in the East where the percentage was found to be much larger. This may be accounted for by the fact that California is comparatively a new country and before the accession of the Philippine Islands syphilis was not as common a disease in the West as it was in the

older parts of the United States, where the population is so much greater. It may take one or two generations for California to show the same percentage as that found by eastern observers. Other reasons no doubt exist why reports vary so in regard to Wassermann tests.

It is stated in an editorial (signed R. B.) in a recent number of the California State Journal of Medicine that "the personal equations of the serologists and the technics employed are the great points upon which we rely when we accept a report at face value." It is suggested that the serologists should "attempt to use an antigen of equal potency," and if "they can not get together on these matters they should furnish on the reverse side of their report an exact description of the technic employed." The technic used by our Dr. Linforth-Boalt, in the serum diagnosis, is the one in use in the General Letterman Hospital, Presidio, which is a modification of the Boas reaction, goat cells being used for the hemolytic system. In reading the test, a triple positive equals 100 per cent. inhibition of hemolysis. A single positive equals 50 per cent. inhibition of hemolysis. The Noguchi technic was carried out with antigen and amboceptor from Dr. Noguchi's laboratory.

## THE WORK AT SLEIGHTON FARM

BY HELEN A. HILL, *Director of Child Study Department,  
Sleighton Farm.*

I feel that our Child Study Department is too new to bring anything authentic to this meeting. However, there are certain points which I believe are of more value now than they can ever be after our work has become better understood by the teachers and officers, and generally systematized throughout the school. I speak especially of the correlation of findings of our tests and the actual experience of those working for some time with the cases.

Ours is really the problem of the feeble-minded in an institution for delinquents. Our opportunities for observation are unusually good, and are very much along the lines hoped for by Ohio, and spoken of by Dr. Emerick and others.

Sleighton Farm is the girls' reformatory of eastern Pennsylvania, under the direction of Mrs. Martha P. Falconer. Our cases are committed by the courts of the State and represent diverse conditions of environment and social conditions, coming as they do from the city of Philadelphia, the mining sections and the Pennsylvania Dutch farming settlements. Our average number of cases is about 450, ranging from eight to twenty-one years of age; all cases are committed for two years at the end of which time they may be sent out on parole.

Our school is eighteen miles from Philadelphia and not within easy reach of any town, so that we are able to turn our girls loose on the farm of one hundred and fifty acres. Our head farmer is a Cornell woman, and we are able to carry on the farm work very largely with the help of the girls. The outdoor work is of immense value to the school, as it offers so many possibilities in training. It at once builds up the girls physically and diminishes the problem of discipline to a minimum.

Our Child Study Department was established in March, 1913. Previous to the establishment of this department, I had



had the opportunity of seeing nearly every child arrested in Philadelphia for six months, many of whom I had tested and observed, meeting many of the parents. This observation led me to feel the importance of a more thorough study of our reformatory cases; therefore, at Sleighton Farm, we have aimed to make the work of practical value to the school in classifying and grading the children both in cottages and school with reference to academic and industrial work and also in the discipline. We send our eugenics officer to the home and in addition to her studies in heredity, she learns as much as possible of the environments in which the child has lived, the school record, and the causes leading up to its delinquency, through the probation officer, aid societies, etc.

We are using the Binet tests as a basis, with tests by Whipple, Healy, and others as supplementary. However, we find Binet all that is required for a working basis. The child is then placed in an observation school, which is held in the reception cottage, where the child remains for three months. The work in the school is almost entirely individual and includes hand work. From this class, the girls are graded and transferred to honor cottages and the regular school department. Many of these girls will be transferred from this school to industrial classes with no academic work other than possibly the letter writing classes. This, we find a great aid to the regular school curriculum as the more defective child need not be a disturbing element among the normal children.

Many interesting facts have come out in connection with the findings of this department and the grading in school. Of the 120 studied thus far we find:

- 1 testing 6 years mentally,
- 6 testing 7 years mentally,
- 19 testing 8 years mentally,
- 21 testing 10 years mentally,
- 18 testing 11 years mentally,
- 12 testing 12 years mentally.
- 15 whom I believe have a normal mentality.

The average physical age of these girls is 14.5. These cases have been discussed in the executive meetings of the school and

in only two cases have those working with the children disagreed with the findings of this department, and those were cases where I believed the girls were of higher mentality and should be held more responsible. In our school, we have found, while our principal has never used any kind of mental tests, that our children of the several mental ages are found in the grades corresponding to that age.

I had the opportunity of testing sixty girls, who are on parole from one of our last State institutions. This work was done two years ago. Of those sixty girls, only four passed the Binet tests successfully. At that time, we were criticized quite severely for saying that those girls were feeble-minded girls. However, it has been our privilege to follow those girls carefully since that time. Some of them have been re-tested, but we have a record of what those girls have done, just where they are today. None of these girls can be said to have really made good. We believe that these girls represent a very fair average of the girls to be found on parole from any State reformatory.

Our physician, Dr. Alice Weld Tallant, in an article in the Bulletin of the American Academy of Medicine, October 1912, reports venereal disease to exist in from thirty to forty per cent. of our cases, while sixty-five per cent. of the cases have been immoral. We also find that immorality is twice as frequent in the low-grade girl. Our problem is also one of legislation, to get suitable provision for cases of such low mentality that they will be able to become self-supporting or to live in society. We hope that this may be accomplished through the establishing of colonies.

SOME RESULTS OF EXAMINING A THOUSAND PUBLIC SCHOOL CHILDREN WITH A REVISION OF THE BINET-SIMON TESTS OF INTELLIGENCE  
BY UNTRAINED EXAMINERS  
SECOND ARTICLE.

BY F. KUHLMANN, *Faribault, Minnesota.*

2. The Assumption That the Majority Must Pass at Age.

There has been much theoretical discussion in regard to the relative frequency of occurrence of different grades of human intelligence. If we could divide off the whole range of intelligence from lowest to highest into equal steps, or grades, what percentage of individuals would belong to each grade, or how would the distribution curve run? Empirical data to show what the exact facts are are not yet at hand, and theoretical discussions have brought us to no consensus of opinion on this question.\* It should follow from this much alone that we have no right to assume that the majority of children tested with the Binet-Simon tests must test out at age in order to show the tests to be accurate, or that when the majority do test out at age it is proof of the tests' accuracy. Known empirical facts give considerable indication that the distribution curve for the different grades of intelligence runs **more or less** parallel to the normal distribution curve in which a majority belong to a middle grade and an equal number deviate in each direction from this middle grade. But this is entirely too indefinite. If the distribution curve is to be used at all to show the range and frequency of error in the mental ages obtained, we must have exact figures on the correct, the real distribution curve as well as on the distribution curve for the mental ages as we get them with the tests. However, granting that the real distribution

\*See especially Bobertag's discussion in article referred to before.

curve for the different grades of intelligence corresponds exactly to the normal distribution curve and that we have exact figures on it, we may point out three other matters to be considered.

The first is that whether or not the majority of children as measured by the tests will belong to the middle grade depends in the first place on the unit of measurement used. A year's mental development is the unit of measurement that has been used, and a child has been called mentally at age when he was retarded or advanced by less than a year. This gives a range of variation in mental age of approximately two years for children classed as testing at age. But the allowance of this range in years is entirely arbitrary, as is the amount of mental development taken for the unit. It would be quite simple and just as justifiable to allow only a half year, or two years of retardation or advancement for the at-age class. Whether the majority pass at age or not is therefore directly dependent on this arbitrary procedure, and ceases to have any meaning as an accurate indication of the degree of accuracy of the tests. To make the distribution curve for mental ages as obtained by the tests correspond exactly to the real distribution curve requires in the first place that for both curves the whole range of intelligence be divided into the same number of equal steps or grades, and that the same number of these steps or fractions thereof be allowed for the middle class for both curves. It is obvious that we can in any case make any proportion of the whole number that we wish belong to the middle class according to how we limit the range of variation from this middle class. In Table IX it was seen that for my results, when fractions of a year are taken into account for both the ages and mental ages, considerably over a bare majority pass at age when allowing a range of nearly two years for the at-age group in using the whole year as the unit of measurement. If now we use the half year as the unit, and call all at age only those who are retarded or advanced by less than half a year, we get the following figures.

TABLE XI

| Age      | 6  | 7  | 8  | 9  | 10 | 11 |
|----------|----|----|----|----|----|----|
| % At Age | 39 | 49 | 33 | 29 | 35 | 43 |

Here considerably less than the majority pass at age. Hence, in order to have a bare majority pass at age the unit of measurement will have to be somewhere between that of a year and a half year. From this follows a further important deduction. This is that the middle or at age group in the distribution curve can not cover nearly one-third of the whole range of intelligence, since the mental ages of adults may range from less than a year to thirteen years. Suppose that the unit of measurement necessary to make a bare majority pass at age were exactly three-fourths of a year, and suppose that we had examined a large number of twelve-year-old children with mental ages from one to twelve years and over. The mental age of the middle group would then range from 11.25 years to 12.75 years, or over a range of 1.5 years. But the range from one to 11.25 is seven and one-half times this. Using the amount of mental development during a year as a unit for measuring brings us to the second point to be considered.

The second point is that the amount of mental development during a year can not be taken as an accurate unit of measurement of intelligence. I have pointed out in other places that the amount of mental development during a year decreased with age.\* Stern,<sup>1</sup> Bobertag,<sup>2</sup> Chotzen,<sup>3</sup> and others have noted the same. Thus at the age of twelve a retardation of a year represents less actual retardation than it does at the age of six. The amount of retardation represented by a year being less for the higher ages it occurs more frequently than it does for the lower ages, and thereby reduces the percentage that pass at age for the higher ages. The magnitude of this factor can not be shown very well from present results because the scale measures too low for the higher ages and too high for the lower ages, thus already affecting too much the percentages that pass at age for the different ages. But perhaps its presence may be said to

\*See "The Binet and Simon Tests of Intelligence in Grading Feeble-Minded Children," this Journal, 1912; and "A Revision of the Binet-Simon System for Measuring the Intelligence of Children," this Journal, Monograph Supplements, September, 1912.

1 Die psychologische Methoden der Intelligenzpruefung und deren Anwendung bei Schulkindern. Bericht, ueber den V. Kongress fuer experimentelle Psychologie, Berlin, 1912.

2 See article quoted above.

3 Die Intelligenzpruefung's methode von Binet-Simon bei Schwachsinnigen Kindern. Zeitschrift fuer angewandte Psychologie, 1912.

be indicated somewhat in the figures in table XI, remembering that in my results on the accuracy of the scale as a whole the scale is shown to become gradually more accurate from the sixth to the eleventh year. Even when the number passing at age is reduced more by this inaccuracy of the scale for the lower ages than it is for the higher ages, an average of 40.3 per cent. pass at age for the ages of 6-8, as compared with 35.6 per cent. for the ages of 9-11. That the rate of development increases with age is shown more directly by other results. Bobertag computed the percentage of increase in the number of seven-year-old children who passed certain of the Binet-Simon tests over six-year-old children who took the same tests, and compared this per cent. difference between six and seven-year-old children with the difference between eleven and twelve-year-old children for another group of tests. Table XII gives these results.

TABLE XII

| Tests      | VII 3 | VII 2 | VII 4 | VII 5 | VIII 1 | VII 1 | VI 5 | VI 1 | Av.  |
|------------|-------|-------|-------|-------|--------|-------|------|------|------|
| 6          | 52    | 35    | 39    | 42    | 32     | 60    | 45   | 53   |      |
| 7          | 93    | 76    | 77    | 77    | 61     | 85    | 69   | 74   |      |
| % Increase | 41    | 39    | 38    | 35    | 29     | 25    | 24   | 21   | 31.5 |
| Tests      | ?     | XI 4  | XI 1  | XI 3  | XII 2  | X 4b* | XI 2 | X 4  |      |
| 11         | 41    | 56    | 59    | 56    | 34     | 64    | 60   | 53   |      |
| 12         | 63    | 78    | 78    | 75    | 50     | 78    | 70   | 62   |      |
| % Increase | 22    | 22    | 19    | 19    | 16     | 14    | 10   | 9    | 16.4 |

The test numbers are given in the first horizontal column, and correspond to those of my revision. The other figures give the percentages of the number of children who passed these tests. It is seen that on the average for the eight tests chosen 31.5 per cent. more of the seven-year-old children pass than the six-year-olds. But only 16.4 per cent. more of the twelve-year-old children pass another group of eight tests than of eleven-year-olds. This is a striking difference. It would have been of much interest to have had Bobertag's results for the other ages and tests also to see how uniformly this difference was present. My own results give equally striking evidence of a decreasing rate of mental development with increase in age in a

\*Test X4b of the 1908 series, which my revision omits.

number of individual comparisons, but there is considerable variation and there are many exceptions. They are given in Table XIII. The Roman numerals give the age-groups of the tests. The ages are given in the first vertical column on the left. The other figures give the per cent. difference for the five tests of each age-group between one age and the next following.

TABLE XIII

|       | VI  | VII  | VIII | IX   | X    | XI   | XII  | XV   | Av.  |
|-------|-----|------|------|------|------|------|------|------|------|
| 6—7   | 2.2 | 12.6 | 14.0 |      |      |      |      |      | 9.6  |
| 7—8   | 1.8 | 4.2  | 23.8 | 14.4 |      |      |      |      | 11.1 |
| 8—9   |     | 5.0  | 18.2 | 20.8 | 8.4  |      |      |      | 13.1 |
| 9—10  |     |      | 3.0  | 6.2  | 6.4  | 16.6 |      |      | 8.1  |
| 10—11 |     |      |      | 10.6 | 12.4 | 14.8 | 9.4  |      | 11.1 |
| 11—12 |     |      |      |      | 1.8  | 3.8  | -1.0 | -2.4 | .6   |
| 12—13 |     |      |      |      |      | 12.8 | 6.6  | 12.6 | 10.6 |
| 13—14 |     |      |      |      |      |      | 0.2  | -.8  | -.3  |
| 14—15 |     |      |      |      |      |      |      | 5.6  | 5.6  |

Thus, on the average for the five tests in age group VI, 2.2 per cent. more of the seven-year-old children passed these tests than the six-year-olds. The general average differences are given in the last vertical column on the right. These last averages should express best the amount of decrease in the rate of mental development with increasing age, and a marked decrease is indicated. The average of these figures again is 10.4 for the first four, 9.6 to 8.1, and only 4.1 for the last four, .6 to 5.6. But a little further analysis shows that there is an important complicating factor. It is noticed that the increase in the percentage of children passing an age-group of tests with increasing age is the greater the more difficult the tests are for the children in question. Thus, comparing six and seven-year-old children, the increase in the percentage of seven-year-old passing is greater for the tests in age-group VII than it is for age-group VI, and greater again for age-group VIII than for age-group VII. There is a general tendency for the figures to increase when read from left to right. Since the tests are too easy in the lower age-groups, the amount of decrease in rate of mental development with increasing age is not brought out fully

by the figures in Table XIII. A re-arrangement of the results will show this more clearly. This is done in Table XIV.

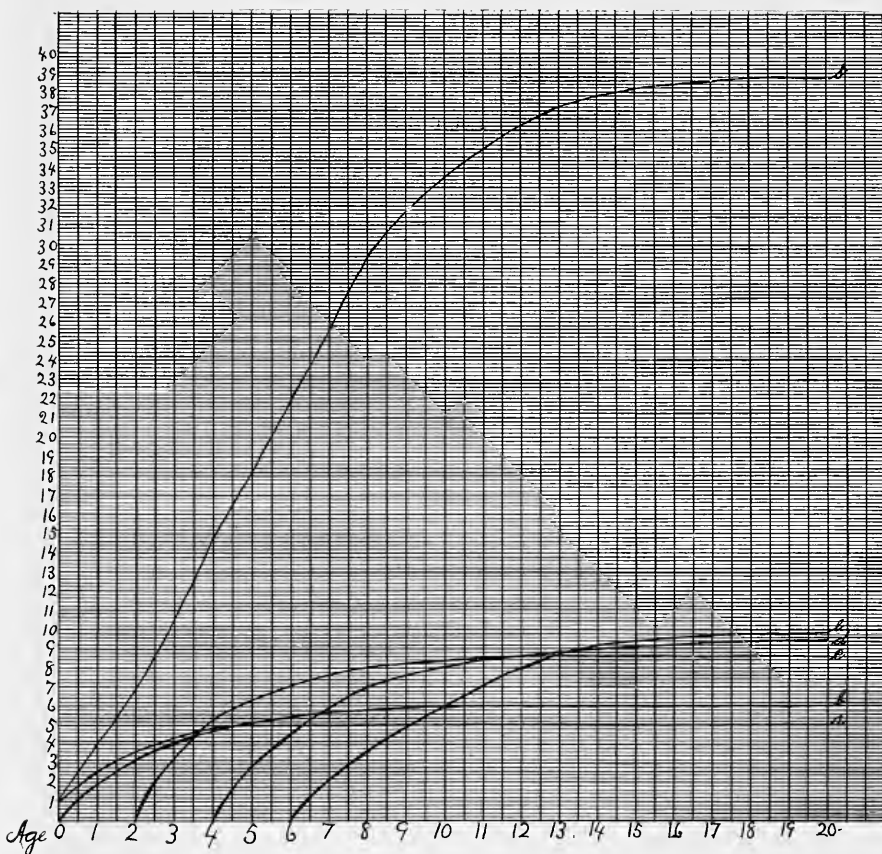
TABLE XIV

|       | 1-30 | No. | 31-64 | No. | 65-100 | No. | Av.  |
|-------|------|-----|-------|-----|--------|-----|------|
| 6-7   | 14.3 | 3   | 23.7  | 3   | 3.4    | 8   | 13.8 |
| 7-8   | 20.3 | 7   | 19.0  | 2   | 3.6    | 11  | 14.3 |
| 8-9   | 14.0 | 2   | 18.2  | 11  | 6.0    | 8   | 12.7 |
| 9-10  | 18.0 | 2   | 12.3  | 6   | 5.4    | 12  | 11.9 |
| 10-11 | 13.5 | 2   | 15.5  | 8   | 8.0    | 10  | 12.3 |
| 11-12 | -5.0 | 5   | 3.4   | 5   | 1.4    | 9   | -6   |
| 12-13 | 13.6 | 5   | 10.0  | 3   | 5.1    | 8   | 9.6  |
| 13-14 | 9.0  | 3   | -1.7  | 6   | 6.0    | 2   | 4.9  |
| 14-15 | 6.7  | 3   | 6.0   | 3   | —      | —   | 6.4  |
| Av.   | 11.6 |     | 11.9  |     | 4.9    |     |      |

For this table the tests were first divided into three classes according to the percentage of children passing them for each pair of consecutive ages. Thus, as seen in the table, there were three tests which were passed by 1-30 per cent of six and seven-year-old children. There were three tests that were passed by 31-64 per cent. of six and seven-year-old children, and eight that were passed by 65-100 per cent. of these children. After being thus divided into three classes according to their degree of difficulty for the children, we can note the increase from one year to the next in the percentage passing, comparing the lower with the higher ages. The other figures in the table give these percentages of increase. Thus, for the three tests that are passed by 1-30 per cent. of the six and seven-year-old children, 14.3 per cent. more of the seven-year-olds pass than of the six-year-olds. This table shows better than the preceding one that (1) the older the children get the less progress they make during a year in the ability to pass given tests; (2) that the progress made during a year decreases with the increase in the ease of the test in the first place. This last fact means that progress in the ability to do the tests is at first rapid and decreases as the child grows older. It is quite analogous to the well-known law of practice, but should not be confused with it. For the progress in ability with which we are here concerned is not a



practice effect, but is due to progress in mental development. It suggests further that we can not view mental development as progress mainly in some one general function such as we usually attempt to describe by the term "general intelligence." The view that mental development consists of the successive and partly simultaneous development of a number of mental functions the combined activity of which is required for the performance of concrete tasks, seems to fit the present facts much better. Thus, only a small percentage of a given group of, let us say, four-year-old children will pass the tests of age-group six, and none will pass the tests of age-group eight. At the age of five this percentage for these same children has increased much for the tests of age-group six, and a very few may pass some of the tests in age-group eight. At the ages of six and seven this amount of yearly increase has fallen for the tests of age-group six, and is less than the year's increase in the percentage passing the tests of age-group eight, and so on. Now, the tests in these age-groups may be quite different in character, so as to involve quite different mental functions or new combinations of their activity. This is in fact the rule in the Binet-Simon system. Four-year-old children do not pass the tests of age-group eight at all because the mental functions required in them have not yet appeared at all in the form necessary. When they begin to appear, at the age of five to six, they develop rapidly at first and more slowly afterwards. Perhaps this view may be expressed best graphically. In the following figure the increase in age is represented on the horizontal line and the degrees of development on the vertical. The different curves from "a" to "f" represent the courses of development of different mental functions. They appear one after the other. They all show rapid progress at first and then more gradually come to their maximum degree of development. They do not all have the same importance for general mental development, and therefore do not all rise to the same height. "S" is the summation curve for the others, and may be regarded as representing the course



of progress of so-called "general intelligence." This figure is not intended to show just when each mental function makes its appearance and how its progress runs. This we are far from knowing at present, nor is it likely that they have such definite beginnings and independent courses. It is intended to show merely that the different mental functions appear successively in a more or less definite order; that their rate of development changes from a rapid start to a gradual finish; that the last appear several years before the approximate intellectual maturity at the age of about fifteen; that as a result, the general mental

development, as represented by the summation curve, progresses at a much more uniform rate than is true of any individual mental function. The last of these is the one of chief importance in connection with our present question as to the amount of mental progress a child makes in a year and the percentage that should pass at age with the tests. If this general progress is more uniform than we might suppose it to be if there were only one general function developing at a changing rate the percentage of children passing at age will not be affected so much by the fact that the amount of development during a year decreases with age. No more definite conclusion is at present possible on this point.

There is a third factor that very probably enters and affects the number passing at age in different degrees for the lower and higher ages. This is the likelihood that mental retardation as expressed by a difference in age and mental age is usually due to a retarded **rate** of mental development. Thus, a child below average intelligence from the start and developing at a slower rate than the average normal rate would fall behind the normal more and more as he grew older, when this deficiency is measured in terms of number of years of development. This would be the case independently of whether the normal rate of development is uniform from year to year or is a decreasing rate. I have elsewhere discussed the evidence for this assumption that mental retardation is chiefly a matter of a retarded rate of development and will not go into further details here.\* It will be seen how this must directly and very seriously affect our present problem as to the percentage of children that should pass at age. The retarded rates of development are of all degrees. For the lower ages the slightly retarded rates will give no appreciable difference between age and mental age, but for the higher ages these differences will have accumulated. Thus, with any group of children, whose rates of development are not alike, but do not vary outside the limits of what we call normal, the ages and mental ages would be the same at first, but would drift apart as the children grew older. The great majority would

\*See "The Degree of Mental Deficiency in Children as Expressed by the Relation of the Age to the Mental Age," this Journal, 1913.

pass at age at first, and later some would be retarded a year or two, and others equally much advanced.

It should be clear when these various matters are taken into account that the percentage of children who pass at age with the Binet-Simon tests can have in itself no particular significance with reference to the frequency and range of error in the mental ages obtained. We can not say that the tests measure correctly when a majority or bare majority pass at age, nor that they measure incorrectly when less than a majority pass at age. The first of Binet and Simon's assumptions, accepted by others, is untenable. It does not, however, follow from the same evidence that the second, namely, that the number of retarded should equal the number of advanced, is also. We may then consider this second assumption next.

### 3. The Assumption That the Number of Retarded Must Equal the Number of Advanced.

Before we discuss this assumption let us be clear as to just what feature of the scale would be tested by it, supposing the assumption to be correct. The percentage passing at age, if we knew exactly what percentage should pass at age at every point, might be an indication of the range and frequency of error in the mental ages obtained. Likewise the percentage of retarded or the percentage of advanced would be. But the mere equality of the latter two percentages would be no proof at all, necessarily. The scale might measure too low frequently and too high frequently for any age and leave the equality of the percentages of retarded and advanced undisturbed, analogous to what we found true of the scale as a whole. When the results for all ages are taken together the percentage retarded approximately equals the percentage of advanced. Yet the scale is inaccurate at both ends. The scale might be shown to be inaccurate on the whole if this equality were disturbed. If the retarded exceeded the advanced in number, for example, it would show that the scale measured too low on the whole. It would in no case indicate the range and frequency of error. We have already considered the accuracy of the scale as a whole and have used the comparison of average age with average mental age as a method to decide this question instead of finding

the relative number of retarded and advanced. But it is more convenient to discuss the correctness of the assumption itself at this point.

The unit of measurement used, whether a whole year, fraction of a year, or more than a year, the uniformity or non-uniformity of the rate of normal mental development, and the course or rate of development in mental retardation, all do not seriously affect the present question. Each affects the percentage of advanced as well as the percentage of retarded, and leaves the degree of their equality mostly undisturbed. The most important question here is for what children this assumption is supposed to hold true. We may divide them into three classes. (1) Entirely non-selected children. (2) Children of the public schools. (3) Normal children. We have a rough idea as to the percentage of the general population, class "1," that is feeble-minded. We also know that public school children are in a measure selected children. Low grade defectives are excluded. Higher grade defectives are excluded more and more as we pass from lower to the upper school grades. We know, thirdly, that the limits between the normal and feeble-minded are still poorly defined. It is obvious that if the present assumption holds true exactly of one class of individuals it can not hold true exactly of the other. The second and third classes are variable and ill-defined as regards exact grades of intelligence that are included. Hence, we can not really carefully test out this assumption for these two classes. No large group of entirely non-selected individuals has ever been examined with the Binet-Simon tests. We have, therefore, no empirical results which could be regarded as adequate to solve this problem. Nevertheless, I am inclined to the opinion that the real distribution curve for the different grades of intelligence for non-selected individuals is not entirely symmetrical, but that it is at least slightly skewed on the side of the lower grades of intelligence. If this opinion is correct, it follows, of course, that the percentage of retarded must exceed the percentage of advanced for a scale of tests that measures absolutely correctly. Assuming a certain grade of intelligence for which there are more individuals than for any other grade, it does not seem prob-

able that the variation above this grade can cover as wide a range as we know the variation below this grade does cover. To be more concrete, seven-year-old children may be retarded seven years, but we do not as a matter of fact find seven-year-old children who are advanced seven years in their mental ages. The limit of variation in this direction, as found by the different authors seems to be about half this much. There seems to be a natural limit beyond which nature does not go in producing high grades of intelligence, but in the other direction the limit is total absence of intelligence. This much seems to be established fact, as a result of the Binet-Simon tests. The question remaining is whether the larger degrees of retardation are frequent enough to seriously disturb the symmetry of the distribution curve. This question we can not answer definitely from any known facts, but one would be inclined to suppose that where a large range of variation in one direction exists as compared with a much smaller range in the other direction, all the degrees of variation in the former direction would also occur more frequently than the corresponding degrees of variation in the latter direction. If four or more years of retardation are possible while four or more years of advancement are not, it seems that two or three years of retardation should occur more easily than two or three years of advancement. If this reasoning is correct, the real distribution curve may be considerably skewed on the side of the lower grades of intelligence.

Thus, we must come to the final conclusion that the distribution curves on the mental ages can not at present be used as a method of testing the range and frequency of errors in these mental ages in any but a very rough way. It may be granted that these curves show that the scale measures accurately within certain rough limits. But we know from other sources that the tests are much more accurate than we can prove them to be by these distribution curves. It is very questionable whether the latter could be of any further service even if we knew the exact nature of the real, true distribution of grades of intelligence. For, besides the various factors discussed above that have to be taken into account, in choosing any group of individuals for examination we always have to rely upon chance,

and assume that the distribution of the grades of intelligence for this particular group is just as it would be for all human beings taken together. To make such an assumption at all permissible we would have to have a group of many thousands of individuals. For supposing that one per cent. of the general population is feeble-minded, for example, which is putting it very high indeed, we would need to examine 10,000 individuals in order to get a hundred feeble-minded. If we had a thousand individuals it would not be permissible at all to assume that ten of them were feeble-minded. Chance might easily have excluded all, or included three times as many. Likewise, with the other grades of intelligence, in proportion to their general frequency.

#### 4. Comparison of Pedagogical and Mental Progress.

A better way of testing the accuracy of the scale of tests than by means of the distribution curves is to test children with varying degrees of intelligence when the relative grade of intelligence is known in each individual case. This is the only direct way in which the range and frequency of the errors made by the tests can be determined. But since this assumes that we have already some other entirely reliable way of knowing the exact grades of intelligence of the children to be tested, this method is as yet unattainable. For we have no entirely reliable way of knowing the exact grade of intelligence of any child which can be applied to any considerable group of children in the time that any single or several investigators together can give to it. We have an approximation to this in the quality of the school work done by the child. We might assume that the progress the child makes in his school work is determined directly by the degree of his intelligence and then grade the child's intelligence by his school work. This assumption, however, is generally recognized as only approximately true, true undoubtedly in the great majority of cases, but still with so many and so wide exceptions as to render it inadequate for the purpose of testing the accuracy of intelligence tests. I shall not attempt to analyze here the reasons why there is no complete correlation between quality of school work and grade of intelligence. For our present purposes the fact and not the

reason for it are alone of importance. But even if we wish to accept this assumption as approximately correct, a further difficulty lies in our way. This is an inadequate means of knowing the quality of the child's school work. It is equally well recognized that school grades or school standings are not infallible indications of quality of work. The grades given by the teachers must, under present circumstances, be partly erroneous, even when the effort is made to grade according to quality of work alone. But grades are usually based on a number of other considerations than that of quality of work. The suggestion, therefore, that has been made by some writers and carried out by a few that in selecting normal children for obtaining test norms we choose only those who are in the school grades in which they belong according to their ages can be regarded only as a small step in the right direction and by no means as a solution of the difficulty of selecting children of approximately the same grade of intelligence. Within the limits of the normal there is a considerable range of grades of intelligence. But even if we took only children who are up to grade in their school work we would include occasionally a feeble-minded child, especially in the case of the lower school grades.

In our present results we can compare the mental ages obtained with the school grades of the children to determine the degree of correlation between pedagogical retardation and mental retardation, or we might compare the mental ages with the average school standing in the different subjects for any school grade. But for the reasons just given the frequency and range of disagreement between the mental ages and the school results can not be taken as a correct measurement at all of the frequency and range of error in the mental ages alone. However, we should expect a close correlation between average mental age of children doing the same quality of work and this work, if the tests measure correctly. The following table shows the decrease in the amount of mental retardation for the children of each chronological age with their advancement in the



TABLE XV

|    | Grade    | 1st   | 2nd   | 3rd   | 4th   | 5th  | 6th   | 7th   |
|----|----------|-------|-------|-------|-------|------|-------|-------|
| 7  | No.      | 60    | 22    | 1     |       |      |       |       |
|    | Av. Dif. | +2.9  | +8.5  | +17.8 |       |      |       |       |
| 8  | No.      | 31    | 40    | 20    | 4     |      |       |       |
|    | Av. Dif. | -3.1  | +1.1  | +11.2 | +28.3 |      |       |       |
| 9  | No.      | 1     | 19    | 56    | 12    |      |       |       |
|    | Av. Dif. | -14.4 | -6.3  | +8.9  | +12.2 |      |       |       |
| 10 | No.      |       | 9     | 25    | 33    | 11   | 1     |       |
|    | Av. Dif. |       | -21.3 | -6.0  | +7.9  | +6.7 | -6.6  |       |
| 11 | No.      |       | 3     | 11    | 32    | 29   | 9     | 1     |
|    | Av. Dif. |       | -27.4 | -12.1 | -5.4  | +1.0 | +10.3 | +12.4 |

school grades. This amount is given in terms of months, the figures being preceded by a minus sign if there is a mental retardation, and by a plus sign if the mental age exceeds the age. The ages are given in the first vertical column on the left, and the school grades in the first horizontal column. Thus, the average mental age of the 60 seven-year-old children in the first school grade is 2.9 months larger than their average age. For the 22 seven-year-old children in the second grade this mental advancement is increased to 8.5 months, and so on.

These figures show a consistent increase in mental age with progress in school work, with no other exception than the ten-year-old children in the fifth and sixth grade. Considering the fact that the number of children for the individual comparison is so small, this close correlation must be regarded as an exceptionally good showing. It gives a much better idea as to how accurately the tests are probably working than can be obtained from the distribution curves.

#### D. The Individual Tests.

The accuracy of the mental ages obtained depends of course in the final analysis on the accuracy of the individual tests. There are three demands to be made of the individual test. (1) A certain definite percentage of normal children of any given age should always pass a test of the corresponding age-group. It is recognized that we can not expect absolutely invariable results with the individual test. That is, we can not

expect, for example, that all normal six-year-old children will pass a test in the six-year-group, and that no five or four-year-old children will, and so on. If this were not the case we should need only one test for each age instead of a group of tests. (2) The percentage of children passing one test in a given age-group should be approximately the same for the other tests in that age-group. (3) The percentage passing any test should rapidly and regularly increase with the age of the children. We will discuss these questions in the order given, but before taking up the first we must consider another question still, namely, the percentage of normal children that should pass any test in order that the system of tests may give correct mental ages.

#### 1. The Percentage That Should Pass a Test.

Binet and Simon do not make any definite statement as to what this percentage should be, but place it somewhere between sixty and ninety per cent. Goddard places it at seventy-five per cent. and over. Terman and Childs regard sixty-six per cent. as the correct percentage. Bobertag discusses this question. He finds roughly that seventy-five per cent. of the children of each age that he tested pass the tests of the corresponding age-group. Also, he finds that according to the teachers' judgments about seventy-five per cent. of the children of the schools do satisfactory work, or better. He concludes from these two facts that seventy-five per cent. is about the correct percentage with which normal children of a given age should pass a test of the corresponding age-group. Stern, also, places it at seventy-five per cent.

My present results indicate a considerably lower figure, sixty to sixty-five per cent., as correct on the whole. Taking other facts already brought out above into consideration, it becomes evident, further, that this percentage should vary some with the age-group. It should be higher for the lower age-groups than for the higher age-groups. We may consider first the percentages of the children that pass the tests of each age-group as a whole, as Bobertag has done. These are given in Table XVI.

TABLE XVI

|      | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 |
|------|----|----|----|----|----|----|----|----|----|----|
| VI   | 92 | 94 | 96 |    |    |    |    |    |    |    |
| VII  | 75 | 87 | 91 | 96 |    |    |    |    |    |    |
| VIII | 26 | 40 | 64 | 82 | 85 |    |    |    |    |    |
| IX   |    | 25 | 39 | 60 | 66 | 77 |    |    |    |    |
| X    |    |    | 51 | 60 | 66 | 79 | 80 |    |    |    |
| XI   |    |    |    | 37 | 54 | 69 | 72 | 85 |    |    |
| XII  |    |    |    |    | 48 | 57 | 56 | 63 | 63 |    |
| XV   |    |    |    |    |    | 17 | 14 | 27 | 26 | 32 |

In this table the first horizontal column of figures from 6 to 15 gives the chronological ages. The Roman numerals in the column on the left give the age-groups. The other figures give the average percentages with which the children of the different ages passed the five tests of the different age-groups. For example, 92 is the average percentage for the five tests of age-group VI with which six-year-old children pass them. For seven-year-old children this percentage is 94, and so on. From these figures we see in the first place that where the tests measure on the whole a fraction of a year too high (see Table I) the average percentage passing the individual test is much above 75, and that where the tests measure on the whole a fraction of a year too low this percentage is much below 75. If no other and disturbing factor entered, it should be valid to conclude that for these age-groups for which the tests measure correctly the proper percentage with which normal children should pass a test would be given in the percentages of the children that do pass the tests of these age-groups. In the present instance the middle age-groups come closest to measuring correctly on the whole. Averaging the figures of Table XVI again for the age-groups VIII to XI, inclusive, gives the following:

Average for tests one year above the age of the children equals 48 per cent.

Average for tests for the figures in "Italics" equal 65 per cent.

Average for tests one year below the age of the children equals 75 per cent.

Since the tests for these middle age-groups measure on the average still just slightly too high, we should infer that the percentage of children that should pass the individual test was still slightly below 65 per cent. We might say, roughly, that the correct percentage is about 60 per cent., that if 50 per cent. or less passed a test it should be shifted upwards in the scale, and that if 75 per cent. or more passed it should be shifted downwards in the scale.

That the 60 per cent. is approximately correct may be seen also from another set of results. These will show at the same time that there is a disturbing factor, the variability of the results due to the untrained examiner, which has to be considered before deciding with certainty on any definite percentage as the correct one. According to the rule of counting the mental age, a year is added to the mental age for every five tests the child passes beyond the age-group in which he passes all the tests. This makes the percentage of children that should pass each test dependent on the number of tests that children on the average pass beyond the age-group in which they pass all. For, if they passed only one or two tests beyond this age-group the mental age would be within a fraction of a year of the age represented by this age-group. The more extra tests they passed beyond this age-group the more their mental age would be removed from the age represented by this age-group. Consequently, in order that the age and mental age may be always the same, six-year-old children, for example, should pass a relatively small number of tests in the six-year group if many tests are passed beyond the age-group in which all are passed, and they should pass a relatively large number of tests in the six-year-group if relatively few tests are passed beyond the age-group in which all tests are passed. If 60 per cent. of normal children pass a test of a given age-group, any one normal child should pass 60 per cent. of the five tests, or three tests of that age-group. We may, therefore, speak of the number or percentage of tests of an age-group that any individual child should pass in place of

the percentage of children that should pass the individual test, and vice versa. To make this clear we may use the following arbitrarily chosen figures for illustration:

|          |            |     |    |    |    |    |
|----------|------------|-----|----|----|----|----|
| <b>A</b> | No. Passed | 5   | 4  | 3  | 2  | 1  |
|          | %          | 100 | 80 | 60 | 40 | 20 |
| <b>B</b> | No.        | 5   | 3  | 2  | 1  |    |
|          | %          | 100 | 60 | 40 | 20 |    |

The "No. passed" means the number of tests passed in successive age-groups. Let us suppose that we are dealing with an eight-year-old child in both cases, A and B. In case A the child passes ten tests beyond the highest age group in which he passes all five. If his age and mental age are the same, eight years, the highest age-group in which he passes all must in this case be age-group VI. Age-group VIII is then the group in which he passes three tests, or 60 per cent. In case B the child passes six tests beyond the highest age-group in which he passes all five. Here age-group VII is the highest age-group in which he passes all, making age-group VIII again the group in which he passes three tests, in order to make age and mental age agree.

We may now consider the number of tests that are as a matter of fact passed on the average beyond the highest age-group in which all are passed, and reverse the process to see what percentage of the children should pass a test in order to give correct mental ages. Table XVII gives the results on this point.

TABLE XVII

|      |      |      |      |      |     | Totals |
|------|------|------|------|------|-----|--------|
| VI   | 3.41 | 1.16 | .23  |      |     | 4.80   |
| VII  | 2.85 | 1.71 | 1.12 | .34  |     | 6.02   |
| VIII | 3.32 | 3.11 | 2.07 | 1.33 | .07 | 9.90   |
| IX   | 3.47 | 2.81 | 2.17 | .08  |     | 8.53   |
| X.   | 3.40 | 2.38 | .28  |      |     | 6.06   |
| Av.  | 3.26 | 2.20 | 1.40 | .44  |     | 7.30   |

The Roman numerals again indicate the different age-groups of tests. The figures following each give the average number

of tests that all the children taking the tests in question pass in the following age-groups. For example, when age-group VI is the highest age-group in which all the tests are passed, 3.41 tests is the average number of tests passed by these same children in age-group VII, 1.16 tests is the average number passed in age-group VIII, and so on. The general average given in the last horizontal column excludes those for age-group X. It is seen at once that these figures approximate those of case "B" in the above arbitrarily chosen illustration, where the extra tests passed run 3, 2, 1 in successive age-groups. Here they run 3.26, 2.20, 1.40, and .44, making a total of 7.30 extra tests in the general averages. The empirical facts, therefore, as given in Table XVII, indicate that something below 60 per cent. is the correct percentage of children that should pass a test of an age-group corresponding to the age of the child. Taking 7 tests in place of 7.3 tests as the total number of extra tests passed, and assuming that the 3.26 tests passed is in age-group VIII, the mental age would be 7 years plus 7 tests, or eight and two-fifths years, instead of eight years. Assuming now, on the other hand, that 2.20 tests passed is in age-group VIII, the mental age would be 6 years plus 7 tests, or seven and two-fifths years, three-fifths of a year too low; 3.26 tests equal 67 per cent. of the group, and 2.20 tests equal 44 per cent. of the the group. The correct percentage with which each test should be passed, therefore, is 44 per cent. plus three-fifth of 67 per cent. minus 44 per cent., or 58 per cent. The results in Table XVII, however, tend to make this percentage slightly too low because of the greater variability that we get with untrained examiners. Examiners poorly qualified to do the work will more or less frequently credit the child with a "failure" in a test where it should be a "pass," and credit him with a "pass" where it should be a "failure." In the general averages these errors tend to neutralize each other, so that correct mental ages are still obtained for the averages. But in the individual cases the highest age-group in which all are passed will often be too low because a child has been marked "failed" in a test when he should have been marked "passed." He will then get a large number of extra tests passed both because the age-group from

which one begins to count extra tests is too low and because the examiner adds the opposite mistake of marking the child "passed" in a test in a following age-group when he should be marked "failed." Now, as was seen above, a relatively large number of extra tests passed requires a relatively low percentage of, say six-year-old children, passing each test in age-group VI in order to make them test correctly in mental age. The number of extra tests passed should be smaller than the results show, and therefore this percentage should be larger. We have no means of knowing accurately how much more irregular the results obtained by these examiners were than they should have been. But we can show statistically that they were too irregular by comparing them with results I obtained in examining about two hundred feeble-minded children with the revised scale. Feeble-minded children are supposed to give more irregular results than normals, because of an uneven development of the former, age and training influences, etc. Yet when we compare these results of the feeble-minded, which were all obtained by one examiner, the writer, with those of the normals, we find that they show less irregularity than do the results with the normals. Table XVIII gives the results of the feeble-minded in the same form as Table XVII gives them for the normals. Comparing the general averages in the last horizontal columns of these two tables, it is seen that the number of extra tests passed beyond the age-group in which all are passed is on the whole less for the feeble-minded than it is for the normals.

TABLE XVIII

|      |      |      |      |     | Totals |
|------|------|------|------|-----|--------|
| VI   | 3.50 | 1.41 | .52  | .20 | 5.63   |
| VII  | 2.74 | 2.20 | .97  | .23 | 6.14   |
| VIII | 3.44 | 2.26 | .96  | .39 | 7.05   |
| IX   | 2.95 | 2.10 | 1.20 |     | 6.25   |
| Av.  | 3.18 | 1.99 | .91  | .21 | 6.27   |

This difference, however, makes only a slight difference in the correct percentage with which children should pass each test, raising it from 58 per cent. in Table XVII to 59 per cent. in Table XVIII.

Thus, both methods of determining the correct percentage of children that should pass a test of an age-group corresponding to the chronological age give approximately 60 per cent. It should, therefore, at least be safe to conclude that the 75 per cent. assumed previously is too high. It remains to add that to the extent in which it is true that the rate of mental development decreases with age, this percentage also decreases with age. The younger children developing much during a year will pass relatively few tests beyond the highest age-group in which they pass all. The older children will pass relatively more tests because the following age-groups are not as much more difficult for them as are the following age-groups for the younger children. As was seen above, this percentage passing a test must be the smaller the larger the number of extra tests passed. The present results are not adequate to show how much this percentage has to change from the lower to the higher ages in order to make the tests always measure exactly correctly.

## 2. The Percentage Passing Each Test.

Having come to a more definite conclusion as to the percentage that should pass each test in order to make the tests measure correctly, we may now consider the percentage of the children who do pass each individual test. In Table XVI we gave only the average percentages for each group of five tests as a whole. In the figures to be considered now we meet directly the influence of the examiner's errors on the results. A high or a low percentage of the children will pass any individual test according to how the test is given and the response interpreted by the examiner. The examiner's way of giving a test can easily make it appear too easy or too difficult for its age-group, when as a matter of fact it is correctly placed. The same is true of erroneous interpretation of responses. The results in Table XIX can, therefore, not be used to show which individual tests are still misplaced in their age-groups. But they will be given to show chiefly one very important fact. This is that the percentages that do pass the individual tests may vary very much from what they should be in each case without causing a very large error in the mental age. Tables I and XIV have already suggested this. Table I has shown that the average mental age



never varies from the average age by more than a fraction of a year, and Table XIV has shown that on the average the tests in age-group VI, for example, are passed by 92 per cent. of the six-year-old children. We are now prepared to show this in more detail.

TABLE XIX

## VI

|   | 1   |    | 2   |     | 3   |     | 4   |    | 5   |    | Av. % |
|---|-----|----|-----|-----|-----|-----|-----|----|-----|----|-------|
|   | No. | %  | No. | %   | No. | %   | No. | %  | No. | %  |       |
| 6 | 34  | 85 | 34  | 100 | 33  | 97  | 30  | 88 | 31  | 91 | 92    |
| 7 | 71  | 90 | 71  | 96  | 70  | 99  | 70  | 93 | 71  | 94 | 94    |
| 8 | 47  | 87 | 46  | 100 | 46  | 100 | 45  | 98 | 46  | 96 | 96    |

## VII

|   | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|---|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|   | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 6 | 38  | 82 | 38  | 58 | 38  | 55 | 38  | 89 | 38  | 89 | 75    |
| 7 | 82  | 90 | 83  | 86 | 83  | 76 | 83  | 95 | 83  | 89 | 87    |
| 8 | 89  | 91 | 89  | 82 | 89  | 93 | 89  | 99 | 89  | 92 | 91    |
| 9 | 54  | 98 | 53  | 94 | 54  | 96 | 53  | 98 | 54  | 96 | 96    |

## VIII

|    | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 6  | 34  | 35 | 34  | 10 | 34  | 6  | 34  | 13 | 34  | 68 | 26    |
| 7  | 82  | 57 | 82  | 22 | 82  | 21 | 82  | 29 | 82  | 73 | 40    |
| 8  | 93  | 80 | 93  | 41 | 93  | 59 | 93  | 55 | 93  | 86 | 64    |
| 9  | 85  | 92 | 85  | 71 | 85  | 79 | 85  | 76 | 85  | 94 | 82    |
| 10 | 62  | 88 | 62  | 71 | 62  | 84 | 62  | 89 | 62  | 97 | 85    |

## IX

|    | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 7  | 48  | 8  | 48  | 21 | 48  | 29 | 48  | 19 | 48  | 48 | 25    |
| 8  | 85  | 19 | 85  | 43 | 85  | 42 | 85  | 32 | 85  | 61 | 39    |
| 9  | 91  | 33 | 91  | 68 | 91  | 60 | 91  | 71 | 91  | 69 | 60    |
| 10 | 79  | 34 | 79  | 84 | 91  | 76 | 91  | 73 | 91  | 65 | 66    |
| 11 | 69  | 45 | 69  | 88 | 69  | 68 | 91  | 96 | 91  | 88 | 77    |

## X

|    | 1   |    | 2   |     | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|-----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %   | No. | %  | No. | %  | No. | %  |       |
| 8  | 49  | 57 | 49  | 84  | 49  | 47 | 49  | 45 | 49  | 24 | 51    |
| 9  | 76  | 68 | 76  | 87  | 76  | 39 | 76  | 67 | 76  | 38 | 60    |
| 10 | 80  | 71 | 80  | 94  | 80  | 54 | 80  | 68 | 80  | 44 | 66    |
| 11 | 81  | 78 | 81  | 96  | 81  | 68 | 81  | 89 | 81  | 62 | 79    |
| 12 | 68  | 90 | 68  | 100 | 68  | 63 | 68  | 87 | 68  | 62 | 80    |

## XI

|    | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 9  | 67  | 40 | 64  | 67 | 64  | 20 | 64  | 28 | 64  | 31 | 37    |
| 10 | 69  | 59 | 69  | 78 | 69  | 41 | 69  | 43 | 69  | 48 | 54    |
| 11 | 79  | 76 | 83  | 83 | 84  | 58 | 83  | 61 | 83  | 69 | 69    |
| 12 | 74  | 76 | 74  | 86 | 74  | 61 | 74  | 66 | 74  | 73 | 72    |
| 13 | 68  | 90 | 67  | 88 | 67  | 76 | 67  | 87 | 67  | 85 | 85    |

## XII

|    | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 10 | 53  | 74 | 53  | 85 | 53  | 40 | 53  | 28 | 53  | 13 | 48    |
| 11 | 70  | 80 | 70  | 88 | 70  | 51 | 70  | 41 | 70  | 27 | 57    |
| 12 | 71  | 73 | 71  | 92 | 71  | 56 | 71  | 41 | 71  | 20 | 56    |
| 13 | 69  | 71 | 69  | 86 | 69  | 61 | 69  | 51 | 69  | 46 | 63    |
| 14 | 64  | 85 | 64  | 84 | 64  | 64 | 64  | 52 | 64  | 31 | 63    |

## XV

|    | 1   |    | 2   |    | 3   |    | 4   |    | 5   |    | Av. % |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-------|
|    | No. | %  | No. | %  | No. | %  | No. | %  | No. | %  |       |
| 11 | 45  | 11 | 37  | 22 | 30  | 17 | 24  | 12 | 23  | 22 | 17    |
| 12 | 53  | 17 | 45  | 13 | 44  | 20 | 41  | 5  | 41  | 17 | 14    |
| 13 | 58  | 38 | 56  | 34 | 54  | 19 | 49  | 22 | 51  | 22 | 27    |
| 14 | 62  | 23 | 59  | 34 | 55  | 35 | 49  | 14 | 52  | 25 | 26    |
| 15 | 36  | 33 | 35  | 23 | 35  | 54 | 34  | 26 | 35  | 23 | 32    |

The headings in this table are the same as used in previous tables. The first figures, for example, mean that of the 34 six-year-old children 85 per cent. pass test VI 1, 100 per cent pass VI 2, etc. Although no one percentage for any test could be safely used to judge whether that test is correctly placed, the figures

show a general tendency which we may note. Using the 60 per cent. as the percentage that should pass a test, it is seen that all the tests in age-group VI may be too easy; that the same is true of most of the tests in age-group VII, and that beyond this some appear as too easy and some as too difficult, with more as just right. That the tests should still measure reasonably accurately is due to the great flexibility given by the rule for counting up the mental age. This makes it possible, in the first place, for one error in one direction to be cancelled by another error in the other direction. It gives us the accuracy of averages for the individual child and largely eliminates the influence of variations with individual tests. It is not one test, nor even one age-group of tests, but usually about five age-groups of tests, or twenty-five tests, that are involved in determining the mental age of a child. Thus every test in any one age-group might be too easy, and yet not increase the mental age over what it should be by more than a fraction of a year. In the second place, the rule for counting up the mental age reduces the increase from one year to the next in the percentage passing a test that is necessary for obtaining accurate mental ages. Eight-year-old children may fail in some tests in age-group VI and VII, as well as in VIII, if they pass about an equal number of tests in age-groups following age-group VIII. These facts may be demonstrated further in the following manner. Table XX gives first the percentages of the children of each age that fail to pass the tests of the age-group corresponding to the chronological age and age-groups below this. These percentages have a minus sign prefixed. Immediately following these

TABLE XX

|    | VI | VII | VIII | IX  | X   | XI  | XII | XV  | Sum |
|----|----|-----|------|-----|-----|-----|-----|-----|-----|
| 6  | -8 | +75 | +26  |     |     |     |     |     | +93 |
| 7  | -6 | -13 | +64  | +25 |     |     |     |     | +70 |
| 8  | -4 | -9  | -36  | +39 | +51 |     |     |     | +42 |
| 9  |    | -4  | -18  | -40 | +60 | +37 |     |     | +35 |
| 10 |    |     | -15  | -34 | -34 | +54 | +48 |     | +19 |
| 11 |    |     |      | -23 | -21 | -31 | +57 | +17 | -1  |

figures for each age are the percentages of the children who pass the tests in age-groups following the age-group corresponding to the chronological age. These have the plus signs prefixed. For example, the average of the percentages of the eight-year-old children passing the five tests in age-group VI is 96 per cent., 4 per cent. of these failing as shown by the —4 in the table. Likewise, 9 per cent. fail on the average in the five tests in age-group VII, and so on. Let us now again substitute percentages of tests passed by any one child for percentages of children passing the tests. That is, let us assume that in the long run any one child eight years old will fail in 4 per cent. of the tests in age-group VI, in 9 per cent. of the tests in age-group VII, etc., and pass in 39 per cent. of the tests in age-group IX, etc. The last vertical column of figures on the right gives the algebraic sum of these percentages. They indicate the percentage of the five tests that a child will measure above or below his age by the mental age obtained. Thus, the eight-year-old child will measure 42 per cent. of five tests above his age, or will have a mental age of 8.42 years. It is seen from this table, then also, that the percentages of the children passing an individual test may vary widely from what should be the case and yet not result in very large errors in the mental ages obtained.

### 3. Uniformity of the Tests within the Age-Group.

The tests of any age-group should be as nearly as possible of the same grade of difficulty and be passed by approximately the same percentage of children. The limits of variation permissible depend on how much difference there is in the percentage of children of one age who pass and the percentage of children of the following age who pass. If this difference is large the variation in degree of difficulty for the tests in the age-group in question may of course be correspondingly large without seriously affecting the results obtained with the tests. We have already seen that the amount of progress children make from one year to the next in the ability to pass a given test decreases as the children grow older. To the extent that this is true it follows that the tests of the higher age-group must have a greater uniformity than the tests of the lower age-groups in order to make age and mental age agree as closely. Where there is

variation the kind and distribution of the variation is important. If the too easy and the too difficult are evenly distributed over the different age-groups the results will in the average be correct again because of the two kinds of errors cancelling each other. This is true also, though in a much smaller measure, of the mental age obtained for the individual child. If an eight-year-old normal child fails in tests in age-group VI and VII because they are too difficult, he will have the chance to pass tests in age-groups IX and X because they are too easy, and thus attain the same mental age he would have reached if all the tests had been just right. The merits of the system of tests is seen, therefore, to lie by no means alone in the accuracy of the individual tests, but very largely in the general plan of the system and especially in the rule for counting up the mental age. Table XIX showed that the percentage of children passing the individual tests in an age-group varied over a wide range. We have no means of telling how much this variation is due to the tests and how much is due to the examiner. Errors due to the examiner may again in a measure be eliminated by finding first the average percentages that pass each test for all the children that take the test. That is, we find in Table XIX the average percentage, for example, for the six, seven, and eight-year-old children that pass test VI 1, and the same for the other tests. This will average the results of several examiners and partly overcome the tendency to an error any one examiner may have had with a given test. These averages are given in Table XXI, together with the variations for each test, which taken together are a measure of the degree of uniformity of the tests of an age-group.

TABLE XXI

|      |    |     |    |     |     |     |     |    |    |    |     |
|------|----|-----|----|-----|-----|-----|-----|----|----|----|-----|
| VI   | 1  | 2   | 3  | 4   | 5   | VII | 1   | 2  | 3  | 4  | 5   |
| Av.  | 87 | 99  | 99 | 93  | 94  | Av. | 90  | 80 | 80 | 95 | 92  |
| V.   | -7 | +5  | +5 | -1  | 0   | V.  | +3  | -7 | -7 | +8 | +5  |
| VIII | 1  | 2   | 3  | 4   | 5   | IX  | 1   | 2  | 3  | 4  | 5   |
| Av.  | 70 | 43  | 61 | 52  | 84  | Av. | 28  | 61 | 55 | 58 | 66  |
| V.   | +8 | -19 | -1 | -10 | +22 | V.  | -26 | +7 | +1 | +4 | +12 |

|     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| X   | 1   | 2   | 3   | 4   | 5   | XI  | 1   | 2   | 3   | 4   | 5   |
| Av. | 73  | 92  | 54  | 71  | 46  | Av. | 68  | 80  | 51  | 57  | 61  |
| V.  | + 7 | +26 | -12 | + 5 | -20 | V.  | + 5 | +17 | -12 | - 6 | - 2 |

|     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| XII | 1   | 2   | 3   | 4   | 5   | XV  | 1   | 2   | 3   | 4   | 5   |
| Av. | 77  | 87  | 54  | 43  | 28  | Av. | 24  | 25  | 29  | 16  | 22  |
| V.  | +19 | +29 | - 4 | -15 | -30 | V.  | + 1 | + 2 | + 6 | - 7 | - 1 |

These variations are variations from the averages of the figures in this table, the plus and minus signs indicating the direction of the variation, a plus sign meaning that the test is easier than the average of the age-group in which it is found. For example, the -7 for test VI 1 means that this test is passed by 7 per cent. less of all the children taking it than the average percentage for the five tests in this age-group. According to these figures there is good uniformity in degree of difficulty of the tests for age-groups VI, VII, XI, XV, and IX, with one exception in IX. Tests VII 5, X 2, and XII 2 seem especially easy, and tests IX 1, X 5, and XII 5 seem especially difficult. The examiner's interpretation of the child's response enters in an unusual degree in the case of tests VIII 5, and IX 2. Test IX 1 appears as too difficult largely because some examiners marked the child as having failed in it, not because he failed to name the pieces of money, but because the test was not given at all. It would not be safe under the circumstances to shift any of these tests into other age-groups upon the basis of the figures in this table.

It will be worth while, further, to compare the degree of uniformity of the tests of each age-group in this revised scale when used on normals with the uniformity found with the 1908 scale when used on feeble-minded. In this comparison two disturbing factors must be taken into account. These are differences in the children, and differences in the examiners. The normals examined with the revised scale should give greater uniformity for the tests because they are normals. They will give less uniformity for the tests because of the many and untrained examiners, the feeble-minded in the comparison being all examined by the writer. The influence of the examiner is largely eliminated in Table XXI, as was noted. In another

connection we also saw above that the feeble-minded examined by the writer using the revised scale gave more regular results than the normals in the present study, indicating that irregularity in results due to feeble-mindedness of the children is less than irregularity due to the examiner. This comparison between the revised and the 1908 scale may be made by averaging the variations for each age-group in Table XXI and comparing these averages with the same averages obtained from results in examining 1,006 feeble-minded.\* These figures are given in Table XXII.

TABLE XXII

| Age Group     | VI | VII | VIII | IX | X  | XI | XII |
|---------------|----|-----|------|----|----|----|-----|
| †1908 Scale   | 17 | 12  | 14   | 20 | 20 | 9  | 14  |
| Revised Scale | 4  | 6   | 12   | 10 | 14 | 8  | 19  |

Here it is seen that there is greater uniformity of the tests in each age-group for the revised scale in every case except age-group XII, and that the improvement is considerable in most cases.

#### 4. Increase with Age in Percentage Passing Each Test.

Stern ‡ points out that the value of a test in the Binet-Simon system depends not alone on a certain percentage of normal children of an age corresponding to the age-group in which the test is placed passing the test, but also on the rate of increase in this percentage with increase in the age of the children. Thus, to use his own illustration, suppose we had two tests passed by the following percentages of normal nine-year-old children.

| Age    | 8  | 9  | 10 |
|--------|----|----|----|
| Test a | 65 | 75 | 80 |
| Test b | 45 | 75 | 90 |

Test "b" would in this case be much better than test "a," as Stern notes. From various considerations already discussed it will now be clear that this is not necessarily true in the case of average results from large numbers of children. The average mental age of a large number of children would be just as nearly correct for tests belonging to class "a" as for tests belonging to class "b," all other things being equal. But it is equally evident

\*The results with the feeble-minded are reported in "The Binet and Simon Tests of Intelligence in Grading Feeble-Minded Children," this Journal, 1912.

†Derived from Table II in article quoted.

‡See article referred to above.

that the more nearly all the tests approach class "b," the more likely will the mental age obtained be correct for each individual child. The question as to the rate of increase in percentage passing a test, with increase in age, that is required in order to make the tests give correct mental ages is complicated in several ways, and the present results are inadequate to show either just what this rate of increase would be with the tests as they are if complicating factors were eliminated, or just what it ought to be. This question was approached above in different connections. It has been seen (1) that the increase from year to year in the per cent. passing is smaller with the older than with the younger children; (2) that it is the smaller the easier the test is in the first place; (3) that the proper percentage of any age passing the tests of the corresponding age-group increases with the decrease in the number of extra tests that are passed beyond the age-group in which all are passed. Now the number of extra tests that are passed beyond the age-group in which all are passed is merely the converse of the increase from year to year in the percentage passing any one test, and involves no new question. Substituting percentage of tests passed in an age-group for number of tests passed, and assuming that six-year-old children, for example, will pass 60 per cent. of the tests in age-group VI, then 60 per cent. of six-year-old children would pass any one test in age-group VI, and vice versa. Likewise, if raising the age-group by a year, or to age-group VII, would cause a drop to 40 per cent. of these tests passed by six-year-old children, then lowering the age of the children by a year, to age five, would cause a drop to 40 per cent. of these five-year-old children passing any test in age-group VI. In more detail, we should have something as follows, assuming arbitrarily certain percentages for illustration:

|    | V   | VI  | VII | VIII | IX  | X  | XI |
|----|-----|-----|-----|------|-----|----|----|
| 6  | 100 | 60  | 40  | 20   | 0   |    |    |
| 7  |     | 100 | 60  | 40   | 20  | 0  |    |
| 8  |     |     | 100 | 60   | 40  | 20 | 0  |
| 9  |     |     |     | 100  | 60  | 40 | 20 |
| 10 |     |     |     |      | 100 | 60 | 40 |



The present question as to the increase from year to year in the percentage of children passing a test becomes, therefore, the one of fundamental importance, for this increase remains the same no matter into what age-group we shift the test. The matter as to the percentage of children of any age passing a test of the corresponding age-group might be easily adjusted by shifting the test into one age-group or another. But shifting of tests can make only rough adjustments, in the case only of tests much different in degree of difficulty from others in their age-group. It was seen before that with a given number of extra tests passed beyond the age-group in which all are passed, the percentage of children of any age who should pass a test of the corresponding age-group in order to make the tests measure correctly is thereby fixed. It is likewise obvious now that with a given rate of increase from year to year in the percentage of children passing any test, this percentage of children who should pass a test is fixed. This latter percentage is therefore in itself of no special importance. With any group or system of tests following the Binet-Simon plan, the procedure should be to first find the rate of increase from year to year in the percentage passing. The individual tests should then be eliminated or retained on the basis of this rate of increase more than on the basis of the percentage passing at any point.

In turning now to the results to see what this rate of increase in the percentage passing each individual test is, we meet the following disturbing factors. (1) Small number of cases; (2) different examiners for children of different ages; (3) lack of uniformity in degree of difficulty of the tests. The first two can again be in a measure eliminated by averaging the figures in Table XIX. For example, we may find the average rate of increase for a year for test VI I, for the years six, seven, and eight, and so on, throughout. This average rate will, however, be much too low because of a very small increase for a year for the older children as compared with the younger children in each case. This is done in Table XXIII, which gives also the average percentage of all the children taking each test that pass the test. This latter percentage gives again the rela-

tive degree of difficulty of each test, and where it is large we expect the average increase to be correspondingly small.

TABLE XXIII

|              |    |    |    |    |    |      |      |    |    |    |    |    |      |
|--------------|----|----|----|----|----|------|------|----|----|----|----|----|------|
| VI           | 1  | 2  | 3  | 4  | 5  | Av.  | VII  | 1  | 2  | 3  | 4  | 5  | Av.  |
| Av. increase | 1  | 0  | 2  | 5  | 3  | 2.2  |      | 5  | 12 | 14 | 3  | 2  | 7.2  |
| Av. passing  | 87 | 99 | 99 | 93 | 94 |      |      | 90 | 80 | 80 | 95 | 92 |      |
| VIII         | 1  | 2  | 3  | 4  | 5  | Av.  | IX   | 1  | 2  | 3  | 4  | 5  | Av.  |
| Av. increase | 10 | 15 | 17 | 19 | 7  | 13.6 |      | 9  | 17 | 10 | 19 | 10 | 1.30 |
| Av. passing  | 70 | 43 | 61 | 52 | 84 |      |      | 28 | 61 | 55 | 58 | 66 |      |
| X            | 1  | 2  | 3  | 4  | 5  | Av.  | XI   | 1  | 2  | 3  | 4  | 5  | Av.  |
| Av. increase | 8  | 4  | 4  | 11 | 10 | 7.4  |      | 13 | 5  | 14 | 15 | 14 | 12.2 |
| Av. passing  | 73 | 92 | 54 | 71 | 46 |      |      | 68 | 80 | 51 | 57 | 61 |      |
| XII          | 1  | 2  | 3  | 4  | 5  | Av.  | XIII | 1  | 2  | 3  | 4  | 5  | Av.  |
| Av. increase | 3  | 0  | 6  | 6  | 5  | 4.0  |      | 6  | 0  | 9  | 4  | 0  | 3.8  |
| Av. passing  | 77 | 87 | 54 | 43 | 28 |      |      | 24 | 25 | 29 | 16 | 22 |      |

This table does not bring out any striking facts not already noted. It shows the decreasing rate of increase with the increasing age of the children, and with increase in ease of the test. The latter makes the rate of increase very low in age-groups VI and VII, where it should be highest. It shows in a number of scattered instances where a relative greater ease of a test lowers the rate of increase, as for example in VIII 5, X 2, XI 2, and XII 2. Since the average percentages in this table on the rates of increase are all too low, we should expect that the real percentage of increase for the ages immediately above and below the age corresponding to an age-group in question would be considerably above 15 per cent. for the middle age-groups, decreasing with the higher age-groups. We may derive the percentages of increase from year to year a little more closely from figures given in Tables XVII and XVIII. Reducing the average number of tests passed in successive age-groups after the age-groups in which all are passed to percentages of tests passed, give the following table.

TABLE XXIV

|             |     |    |    |    |   |
|-------------|-----|----|----|----|---|
| Table XVII  | 100 | 65 | 44 | 28 | 9 |
| Table XVIII | 100 | 64 | 40 | 18 | 4 |
| Average     | 100 | 65 | 42 | 23 | 7 |

Table XVII gives the results of normals examined by untrained examiners. Table XVIII gives the results of feeble-minded examined by the writer. Since the percentage of tests passed in successive age-groups by children of one given age is merely the converse of the percentage of children of successive ages passing any one given test, as was seen above, we need merely to read the percentages in Table XXIV backwards, from right to left, in order to get the increase with age in the percentage of children passing a test. In round numbers, these percentages would run about as follows: 0-10-20-40-65-100. In conclusion on this point it should be repeated and emphasized that it is this rate of increase that represents the degree of general accuracy of the tests, and fixes the percentage of children of any age that should pass a test of the corresponding age-group. Shifting of tests from one age-group into another because they are found relatively easy or difficult should be done on the basis of a percentage that is derived from this rate of increase instead of on the basis of some arbitrarily assumed percentage, as has been done heretofore. To improve the scale of tests much further with this method along this line will require much more exacting work than has yet been attempted by any investigator.

#### E. SUMMARY.

A number of qualifications are necessary to make a good examiner with the Binet-Simon tests. These, together with the training required to attain these qualifications, were briefly summarized on pages 156-157 of the previous number of this Journal.

The untrained examiner meets difficulties because he lacks the following: (a) Familiarity with the directions for giving the tests. (b) Familiarity with the rules for interpreting the responses of the children. (c) Ability to adapt the procedure in testing in special instances for which directions can not be given. (d) Ability to interpret responses in special instances

for which rules can not be given. (e) Ability to adapt himself in attitude to the mental levels of children of different ages so as to obtain the best efforts from the child in each case. (f) General appreciation of the absolute necessity of adhering strictly to all the rules of testing, and of careful, painstaking work.

These deficiencies are of quite different degrees of importance. The last is, on the whole, the most serious and most frequent, and can be remedied only by extended laboratory training. A few, but rather exceptional, untrained examiners do not lack this qualification. The amount of error made by an examiner because of his lack of training seldom equals two years in the mental age; in the majority of cases it is less than one year.

The revised scale measures on the whole a fraction of a year too high for the lower ages, beginning with the age of six, and a fraction of a year too low for the higher ages. The difference between the average age and the average mental age is, however, reduced as compared with what the results of others show to be true of the 1908 scale, this being the case especially for the higher ages. Beyond the mental age of ten the scale measures too low mostly because there are no tests for ages beyond twelve, excepting age-group XV, which fact prevents children of these higher mental ages getting extra credits for extra tests passed beyond the age-group in which they pass all, according to the rule for counting of the mental ages.

The chief method of determining the range and frequency of errors in the mental ages obtained in the results of individual children has been to find the relative number who pass at age as compared with the number who are retarded or advanced in mental age, and by comparing the nature of such a distribution curve with the "normal distribution curve." Following this method the revised scale, like the 1908 scale, shows that the number of advanced exceeds the number of retarded for the lower ages and the number of retarded exceeds the number of advanced for the lower ages with some improvement shown in the revised scale. Comparison of the present results with those of others on this point is, however, rendered difficult and

uncertain because of the varying conditions under which the results of others have been obtained, and the different forms in which the results have been expressed. Chief among these are: (a) Selection or non-selection of children with reference to their normality; (b) varying qualifications of the examiners as examiners; (c) keeping or dropping fractions of a year in the ages; (d) keeping or dropping fractions of a year in mental ages.

It is impossible with this method, however, to determine the range and frequency of error in the mental ages obtained with a reasonable degree of accuracy. We do not know enough about the true nature of the distribution curve for the different grades of human intelligence, or how closely it corresponds to the "normal distribution curve." The assumption made by Binet and Simon, and accepted by others, namely, that the tests will measure accurately if the majority pass at age and if the number of retarded equals the number of advanced, are in part inadequate and in part probably erroneous. The question as to whether the majority will pass at age depends in the first place on the unit of measurement used, whether it is a fraction of a year, a year, or more than a year of mental growth. The choice of a year as the unit is entirely arbitrary; any other time period with equal claims to validity might be taken and make a bare majority, less than the majority, or a large majority pass at age. Choosing the amount of mental development during any given period of time as a unit for mental measurement is, moreover, complicated and probably rendered inaccurate by the fact that the rate of normal mental development decreases with age, so that when such a unit is used more will pass at age for the lower ages than for the higher ages. Evidence that there is a decrease in the rate of mental development with increasing age is given in the present results showing that the increase from one year to the next in the percentage of children passing the same group of tests is greater for the younger children than for the older children. The number passing at age varies with age further because the amount of retardation or advancement in case of development below or above the average normal rate accumulates with age. Each of these two factors must result

in more passing at age for the lower ages than for the higher ages.

The equality of the percentages of retarded and advanced has no meaning with reference to accuracy of the tests unless taken in connection with the exact percentage that pass at age, for the scale might, with equal frequency, measure much too high and much too low. It is necessary also to determine for what class of children this equality must hold true; whether it is for average normal children, entirely non-selected children, or for some other class. This assumption is probably erroneous if applied to a non-selected class of children.

We know from the other sources combined that the tests are much more accurate with reference to range and frequency of error in the mental ages obtained than we can prove them to be by these distribution curves.

There is a close correlation when averages are considered, between retardation and advancement in school grades, and mental retardation or advancement as shown by the mental ages obtained.

A good test must meet three requirements: (a) A more or less invariable percentage of normal children of a given age should always pass it. (b) This percentage should be approximately the same as it is for the other tests in the same age-group. (c) This percentage should rapidly and regularly increase with the age of the children.

The percentage of children of a given age that should pass a test in the corresponding age-group in order to make the test measure correctly is determined by the rate of increase in the percentage passing with increasing age of the children. For the present system of tests it is 60 to 65 per cent. instead of the 75 per cent. assumed and more or less agreed upon by a number of writers as a basis for shifting a few tests into other age groups. For the age-groups of VIII to XI inclusive, where the tests measure quite accurately on the whole, 65 per cent. of the children pass a test of an age-group corresponding to the age of the children; of the children one year younger 48 per cent. pass, and of the children one year older 75 per cent. pass. The value of any individual test is indicated chiefly by this rate of increase

from one year to the next in the percentage of normal children passing it. The correct percentage for any given age is incidental to this rate and to the rule for counting up the mental age. This percentage, moreover, must vary for different parts of the system, being higher for the lower age-groups than for the higher age-groups.

The rule for counting up the mental age is a very important and essential part of the system. This tends to correct the errors of individual tests, the error of a too difficult test in one age-group being corrected by the error of a too easy test in a following age group, and vice versa. The actual percentage of children passing the individual tests varies widely above and below 65 per cent. even where the tests measure very accurately on the whole.

There is a considerable greater uniformity as regards degree of difficulty among the tests of each age-group in the revised scale than is true of the 1908 scale.

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## REVIEWS AND NOTICES

The Hygiene of the School Child. LEWIS M. TERMAN, *Associate Professor of Education, Leland Stanford University. Boston, New York, and Chicago: Houghton Mifflin Co., 1914. Pp.X+ 417.*

This book is an attempt to "digest and interpret" the recent literature on the hygiene of the school child, and present it in usable form for normal schools, colleges, and reading circles. It thus brings together facts from many fields which for the most part are inaccessible to most readers for whom it is intended, because it is scattered through several languages and many magazines, and is largely of a technical nature. Its division into twenty-one brief chapters indicates a wide-scope treatment, as may be seen from the following chapter headings: The broader relations of educational hygiene; the physical basis of education; the general laws of growth; the factors influencing growth; some physiological differences between child-



ren and adults; the educational significance of physiological age; disorders of growth and the hygiene of posture; malnutrition in school children; tuberculosis and the school; the physiology of ventilation; the teeth of school children; the nervous child; common neuroses of development; the education of nervous children; speech defects and the hygiene of the voice; the sleep of school children; some evil effects of school life. While not aiming to discuss feeble-mindedness, it contains considerable data of interest to students of this subject. The bearing of the various physical and functional anomalies described on mental development is shown throughout. Among these anomalies are especially malnutrition, physiological retardation, defects of teeth, tonsils, adenoids, hearing, vision, headaches and nervousness. The book is very readable, written in an aggressive style, yet without a straining of the interpretation of the facts presented. It is unusually well adapted to fulfill its purpose of a text-book for teachers and students intending to teach.

Faribault, Minnesota.

F. KUHLMANN.









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